ERRATA SHEET

for M.I.T. Lincoln Laboratory Report 71G-5

AIR LOADS AND PRESSURE DISTRIBUTION
ON A PARABOLIC ANTENNA MODEL

14 November 1962

Some discrepancies in dimensions of the antenna model were noted when comparing this report with the preliminary M.I.T. Wind Tunnel Report #993. The model was measured to ascertain the correct dimensions. Kindly make the following corrections in your copy of Report 71G-5.

Page 8 In Figure 4, Change

$4\frac{1}{4}$ to $4\frac{1}{2}$

7 to $7\frac{1}{4}$

28 January 1963

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FOR ERRATA

AD 290 512

THE FOLLOWING PAGES ARE CHANGES

TO BASIC DOCUMENT

FOREWORD

This report is a summary of the wind tunnel testing carried out on a model of a parabolic radar antenna for Group 76 of the Lincoln Laboratory. Mr. Joseph Orabona was the project leader for Group 76.

Previous tests on this antenna were reported in Wright Brothers Wind Tunnel Reports 967 and 993. Large support interference effects limited the utility of this data. A new mounting system used in the present tests renders the previous results obsolete.

Preliminary results of this series were released as M.I.T. Wind Tunnel Report 1015.

LIST OF SYMBOLS

Configuration Symbols

RF	Model backup structure, pedestal, and counter-weights
M	Mesh reflector
S	Solid surface reflector, attached over mesh reflector
Sp	Solid surface reflector with pressure taps, attached directly to back-up structure

Other Symbols – See text and figures for definitions

θ	Elevation angle
ψ	Yaw angle
C_L	Lift coefficient
C_D	Drag coefficient
C_Y	Sideforce coefficient
C_l	Rolling moment coefficient
C_m	Pitching moment coefficient
C_n	Yawing moment coefficient
C_p	Pressure coefficient
ΔC_p	Pressure loading coefficient

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INTRODUCTION

A series of tests on a parabolic scanner model was conducted for the M.I.T. Lincoln Laboratory at the Wright Brothers Wind Tunnel at M.I.T. during the periods October 13 1961. to January 2, 1962, and May 25 to June 1, 1962. The wind tunnel is a low subsonic velocity test facility with an elliptic test section measuring 7 1/2 x 10 feet.

The purpose of the experimental investigation was to determine the airloads – pitching, rolling and yawing moments, lift, drag, and sideforce – on a parabolic reflector with a simulated screen and a solid surface and to determine the pressure distribution on the solid surface reflector.

DESCRIPTION OF MODEL

The Lincoln Laboratory model was a 1/24 scale model of a 60 foot diameter paraboloidal scanner similar to the Millstone Hill installation. This size model was chosen to keep the wall blocking effects within reasonable limits. This laboratory's normal practice is to restrict the model frontal area to less than 6 square feet (10 percent of the tunnel test section area). The focal length to diameter ratio was 0.40. A mesh screen (MRF), a solid screen (MRFS), and a solid surface provided with pressure taps front and rear (RFS_p) were the surfaces fitted to the reflector structure. The diameter of the model reflector was 2.5 feet and its depth at the center was 4.5 inches. Figures 1 2, and 3 depict the scanner with its different configurations. The mesh screen was made of expanded metal (trade name – Square X, size 1/4 inch) with 62 percent transmission as indicated by a light meter test. It should be noted that the meshes on the expanded metal have a preferred direction. The model mesh was applied with the centerline of each mesh tilted downward out along the parabolic axis. A solid surface simulated snow and ice on the mesh surface. The pressure distribution model was also solid with pressure taps located on the front and rear surfaces and pressure leads molded into a

fiberglass shell. Figure 6 shows the geometrical locations of these taps.

TEST PROGRAM

Tests were run on the mesh and solid reflector to determine the six component air loads at airspeeds of 60 and 90 mph indicated. The yaw angle range of 0 to 360° for the elevation angle range 0 to 80° was covered. A few tests were made to determine the tare effects of the exposed support strut. Ground effect was not simulated.

The pressure distribution was measured on the front and back surfaces at yaw angles from 0 to 360° at zero elevation angle. Only a quarter of the reflector had pressure taps. By rotating the reflector on its backup structure, the taps were moved to a new quadrant and the yaw angle range repeated. These tests were run at 90 mph indicated.

COMPUTATION OF RESULTS

The data was recorded in the wind axis system having the origin at the balance resolving center which lay on the axis of symmetry of the scanner at zero elevation angle. The wind axis system is defined as having axes in the horizontal direction normal to the wind direction, the vertical direction, and the wind direction. Figures 4 and 5 depict diagrammatically the different dimensions of the model and axis locations. The yaw or azimuth angle, ψ, indicates rotation around the vertical axis, $\psi = 0$ for the reflector facing upstream, and positive for the reflector rotated to the right. The pitch or elevation angle, θ, indicates rotation around the horizontal axis, zero for reflector axis horizontal, and positive for the axis tilted upward.

The wind axis system stays fixed to the tunnel regardless of ψ or θ and is defined as follows: Looking upstream, the forces and moments are:

Drag:	Positive in the downstream direction (horizontal)

Lift:	Positive vertically upward.
Sideforce:	Positive to the right.
Pitching moment:	A positive right hand pitching moment vector is horizontal and to the right.
Yawing moment:	A positive yawing moment vector is vertical downward.
Rolling moment:	A positive rolling moment vector points upwind, and is horizontal.

The data was reduced to coefficient form for the same axis system. and corrections for tare forces and moments due to the support system and blockage effect of the tunnel wall were introduced. The force, moment, and pressure data were reduced to dimensionless coefficient form. The directions of the coefficients are shown in Figure 5 and the coefficients themselves are defined as:

C_L = Lift/qS
C_D = Drag/qS
C_m = Pitching moment/qSD
C_Y = Sideforce/qS
C_n = Yawing moment/qSD
C_l = Rolling moment/qSD

where q is the dynamic pressure of the airstream, $(\rho V^2/2)$, 20.719 psf at 90 mph, S is the antenna frontal area, 4.91 square feet, and D is the antenna diameter, 2.50 feet.

The pressure distribution data was referred to stream static pressure, corrected for blockage effects. The pressures were reduced to coefficient form by dividing by stream dynamic pressure.

$$C_p = \frac{P - P_{\text{Stream static}}}{q}$$

A set of pressure loading coefficients were computed by taking the difference between the front (concave side) and rear pressure coefficients at each point. This is the net aerodynamic loading at each point, positive from concave to convex side, divided by the stream

dynamic pressure:

$$\Delta C_p = \frac{P_{concave} - P_{convex}}{q}$$

COMMENT ON RESULTS

The pressure loading coefficients for head wind condition, $\psi = 0$, $\theta = 0$ (Fig. 7) integrate to a drag coefficient $C_D = 1.45$. This compares favorably with measured C_D of 1.48. These are typical values for solid reflector surfaces of focal length to diameter ratio of 0.4.

There is excellent symmetry of the loadings about a vertical axis but the symmetry top to bottom is not as good. There is a small amount of support interference in the loadings and examination shows it to be on the front face. Compare C_p's for tap 47 quadrant I with 47 quadrant IV for $\psi = 0$, Runs 1 and 13.

The maximum loading coefficients are the order of 2.1 on the edge for a yaw angle of 60°.

The force and moment data for the solid reflector for 90 mph airspeed is plotted in Figures 13 through 18. Only the 90 mph data was plotted; the 60 mph shows no significant difference from the 90 mph data.

On the whole, the symmetry of the results is satisfactory. There are small departures from zero force or moment coefficients for test conditions which, due to symmetry, should produce zero values. These loads for the solid screen are attributed partly to errors in support tare corrections, and partly due to the directional properties of the expanded mesh over which the solid reflector was attached. The values for the mesh reflector are not minor, as for example C_L vs. ψ for the MRF configuration, Fig. 19. These lifts are due to the non-symmetry of the expanded mesh. Other components similarly affected are pitching and rolling moments.

The maximum lift coefficient of the solid reflector is 1.12 at $\psi = 0$, $\theta = 60$, comparing favorably with the maximum sideforce coefficient of 1.17 at $\psi = 60$, $\theta = 0$. Maximum moment coefficients are $C_m = -0.17$ at $\psi = 0$, $\theta = 60°$ and $C_n = 0.14$ for $\psi = 120$, $\theta = 0$. The maximum values for the mesh reflector are somewhat lower.

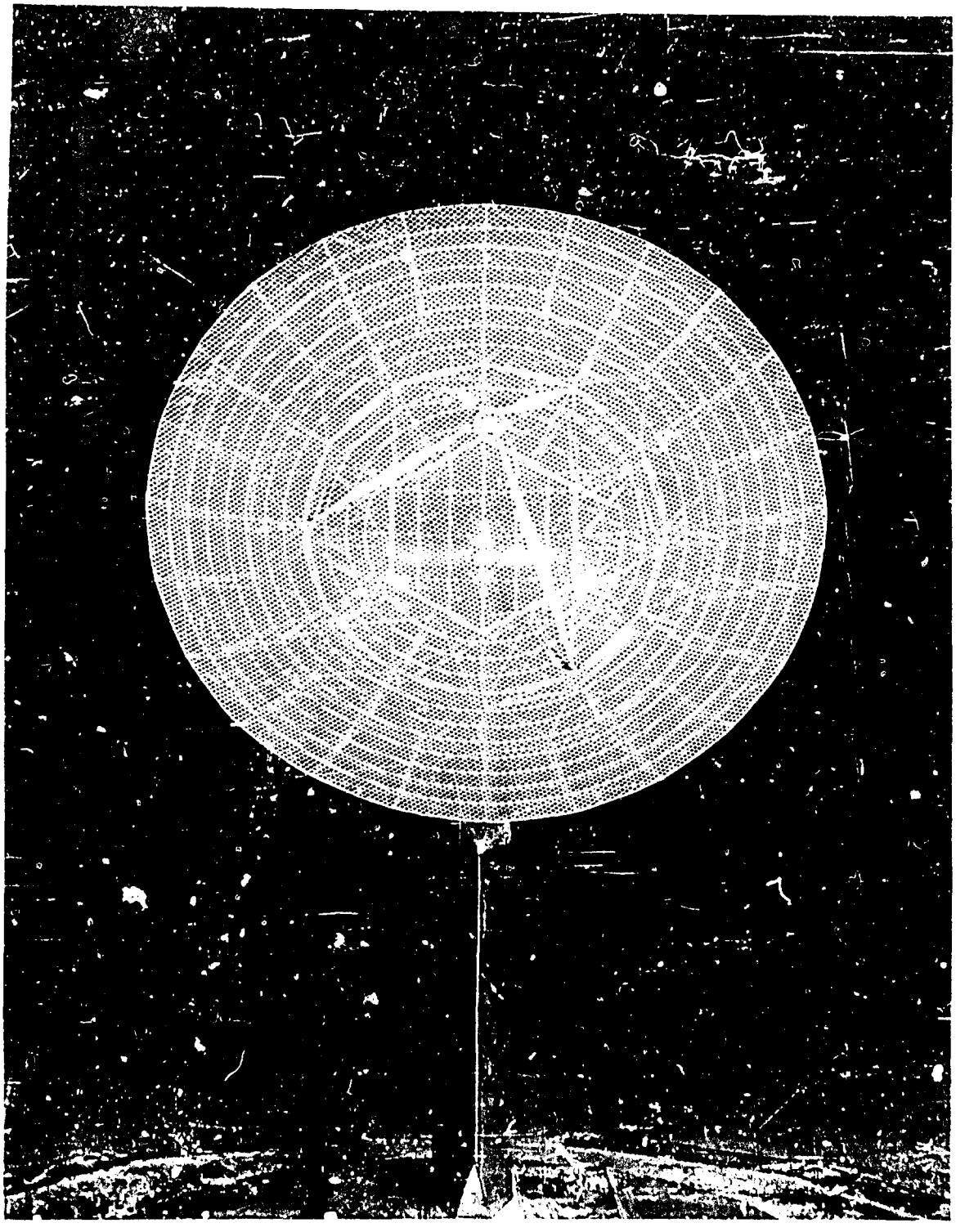


Fig. 1 Mesh Reflector MRF, ψ = 180, Θ = 20 View Looking Upstream.

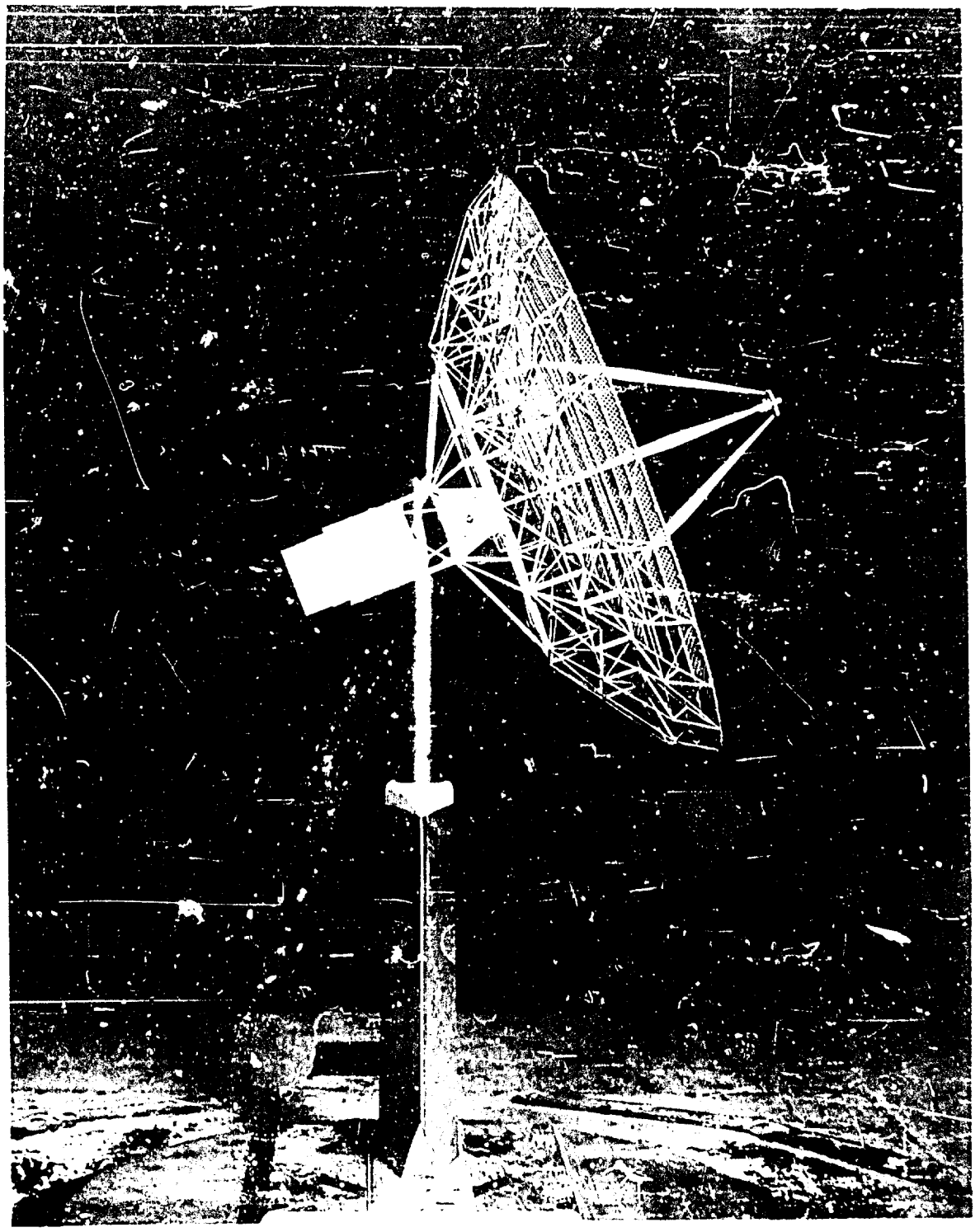


Fig. 2 Mesh Reflector MRF, $\psi = 90$, $O = 20$ View Looking Upstream.

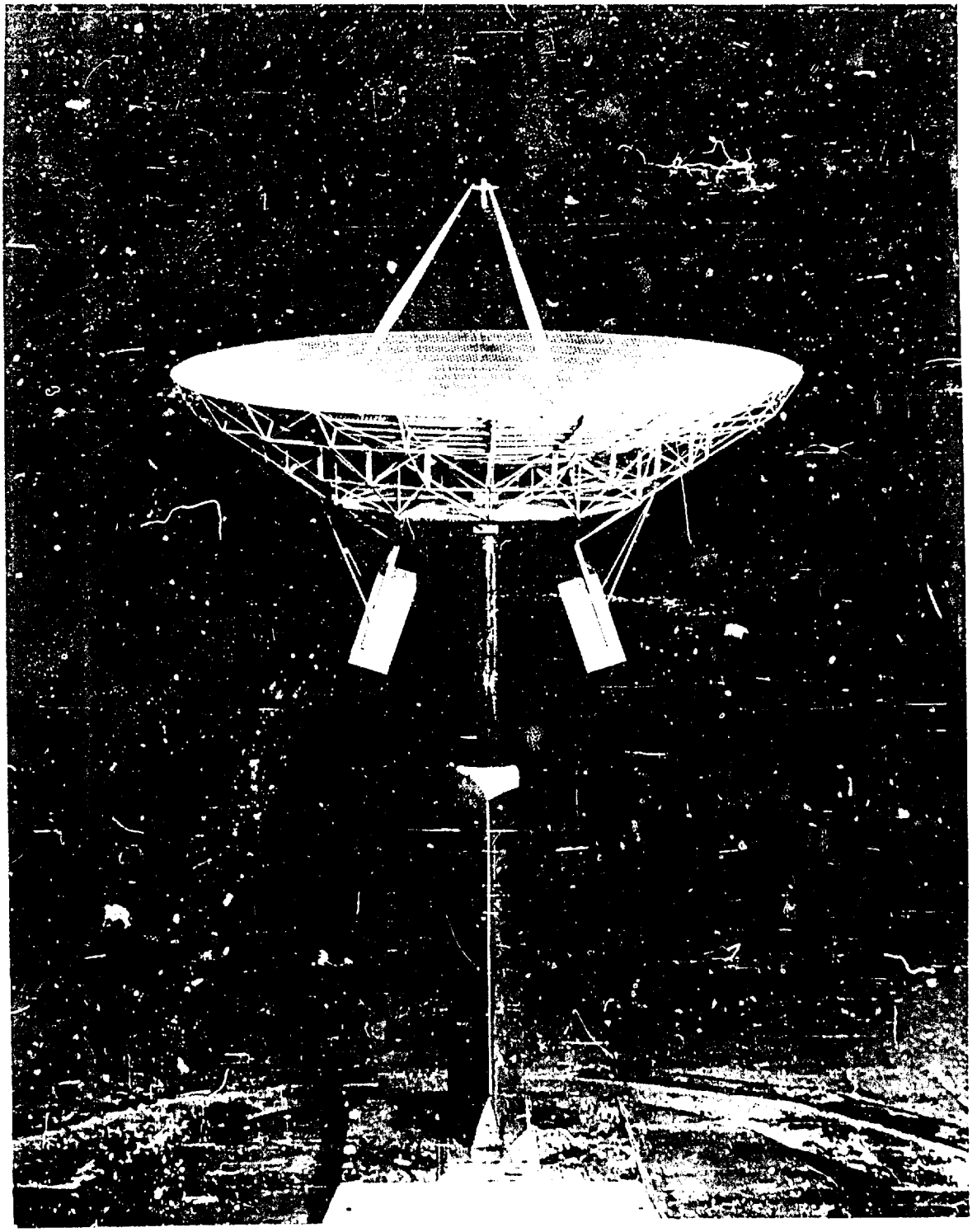


Fig. 3 Mesh Reflector MRF ψ = 180, O = 80 View Looking Upstream.

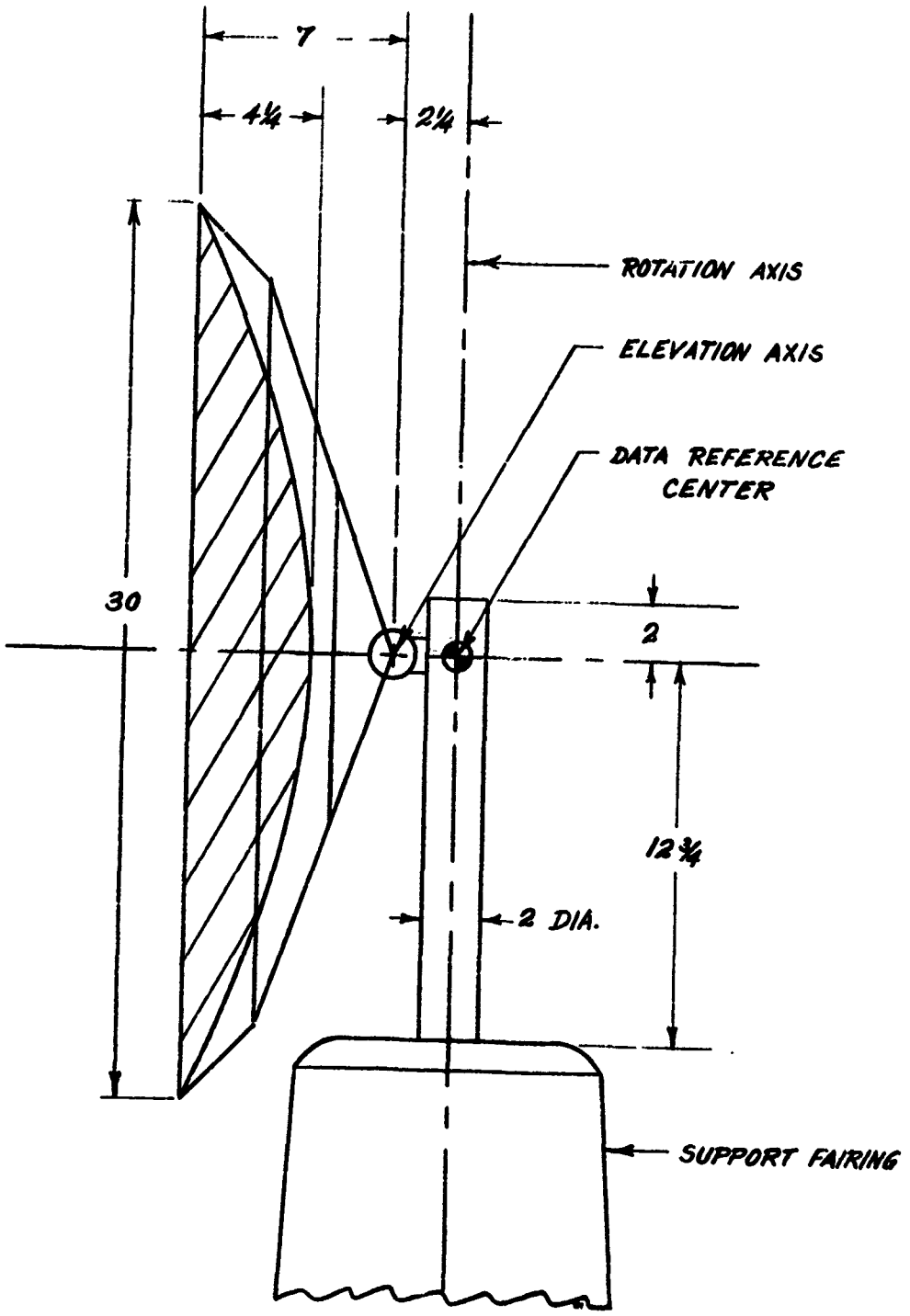
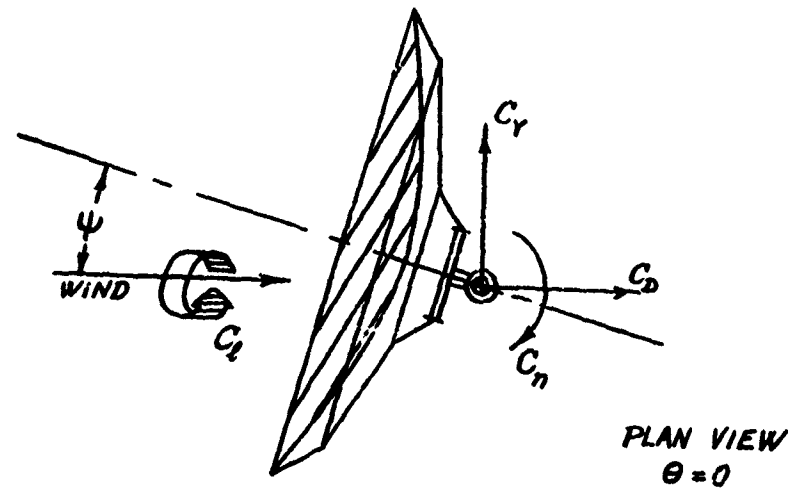
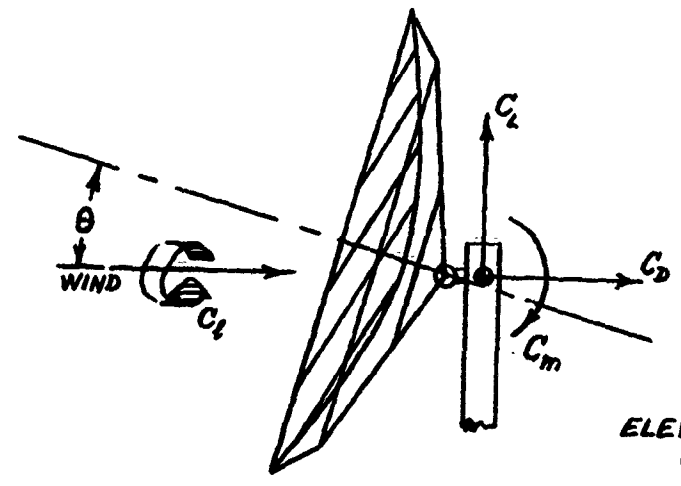


Fig. 4 NOTE: ALL DIMENSIONS IN INCHES
SCALE . 1/5

WIND AXES



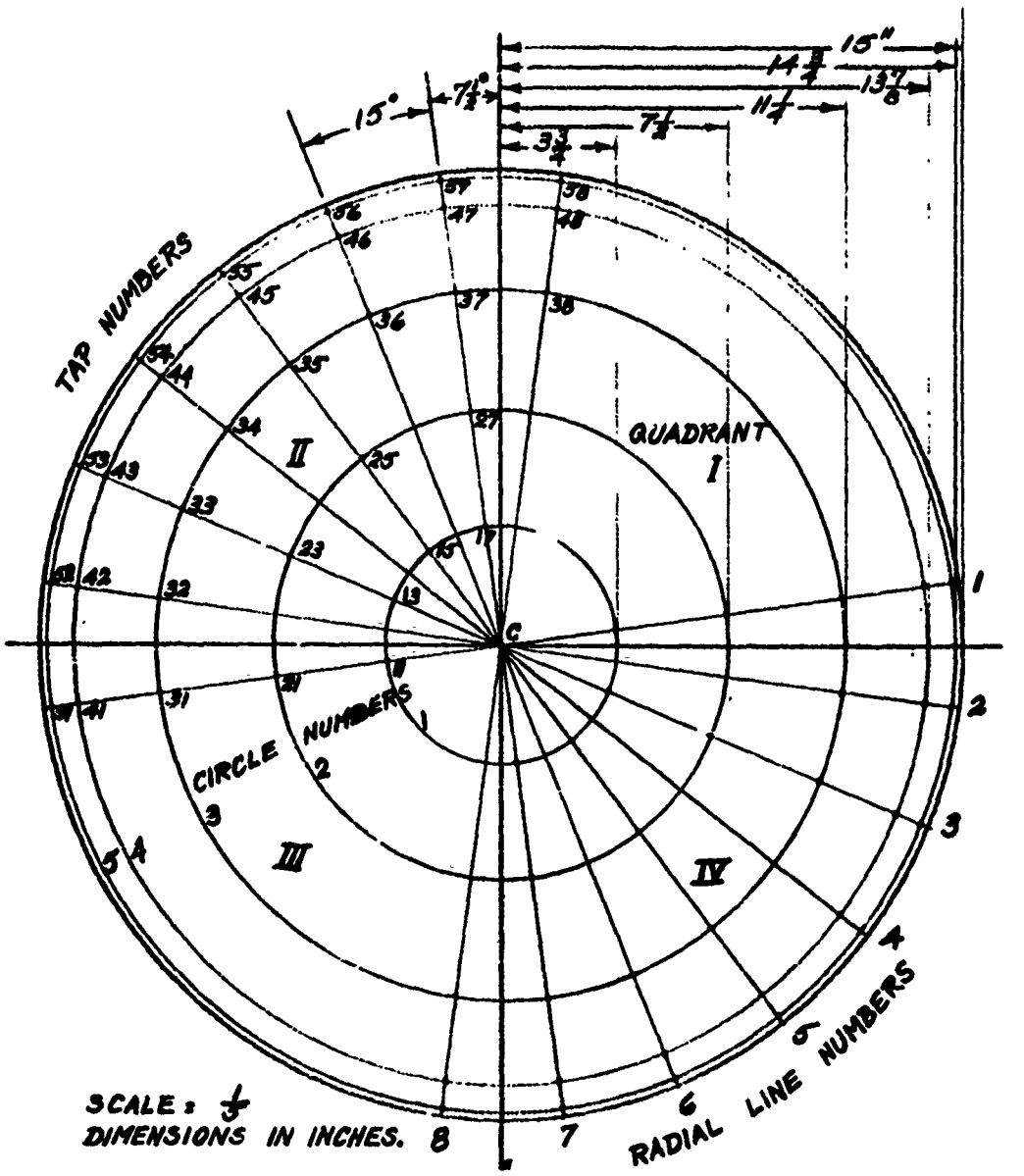
PLAN VIEW
$\theta = 0$



ELEVATION VIEW
$\psi = 0$

POSITIVE FORCE AND MOMENT COEFFICIENTS

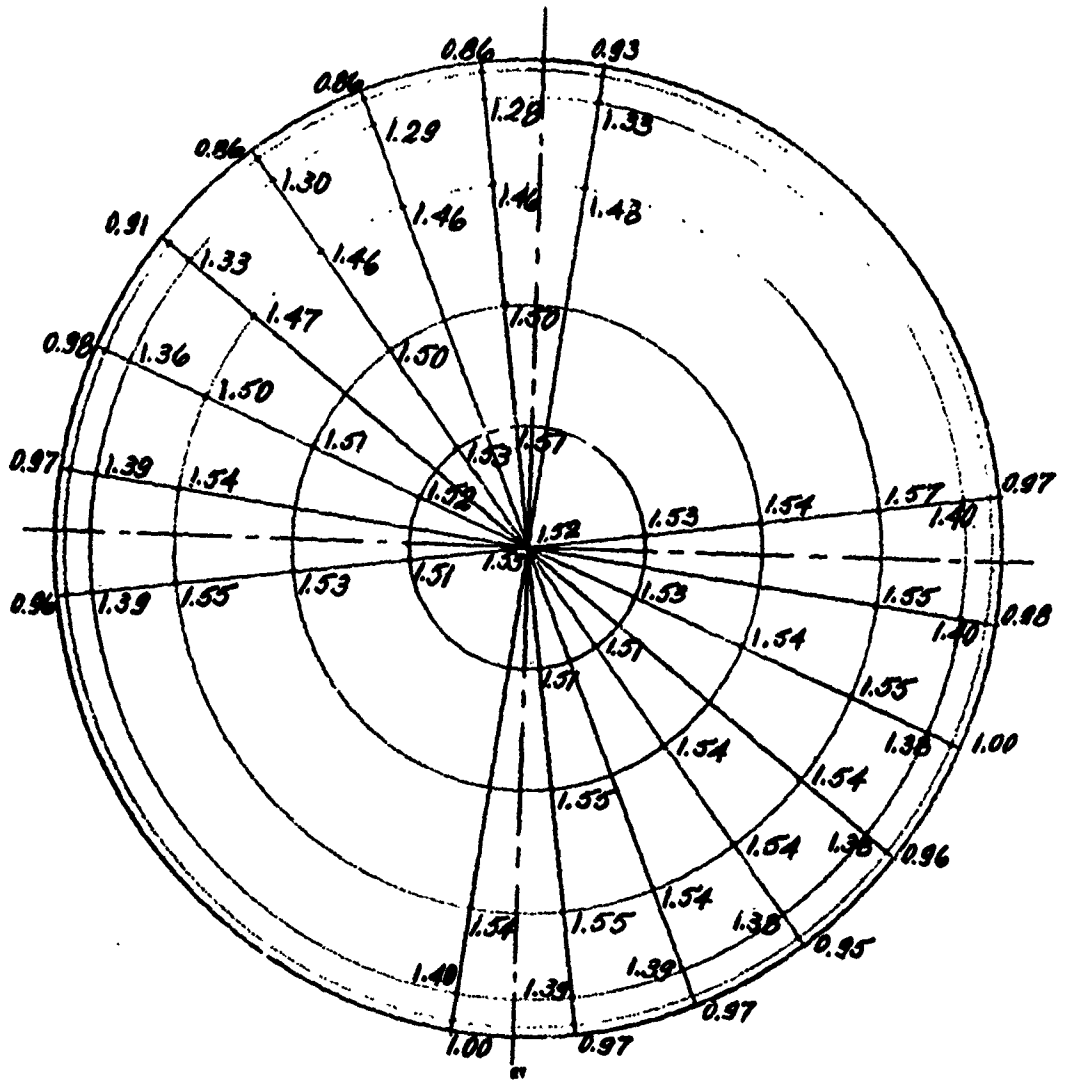
Fig. 5



TAP LOCATIONS AND NUMBERING SYSTEM
FRONT VIEW

NOTE: FIRST DIGIT OF TAP NUMBER INDICATES THE CIRCLE, SECOND DIGIT INDICATES THE RADIAL LINE ON WHICH TAP IS LOCATED. THE FRONT IS LABELED "F", THE REAR "R". ROTATING THE MODEL 180° BRINGS TAPS TO QUADRANT IV.

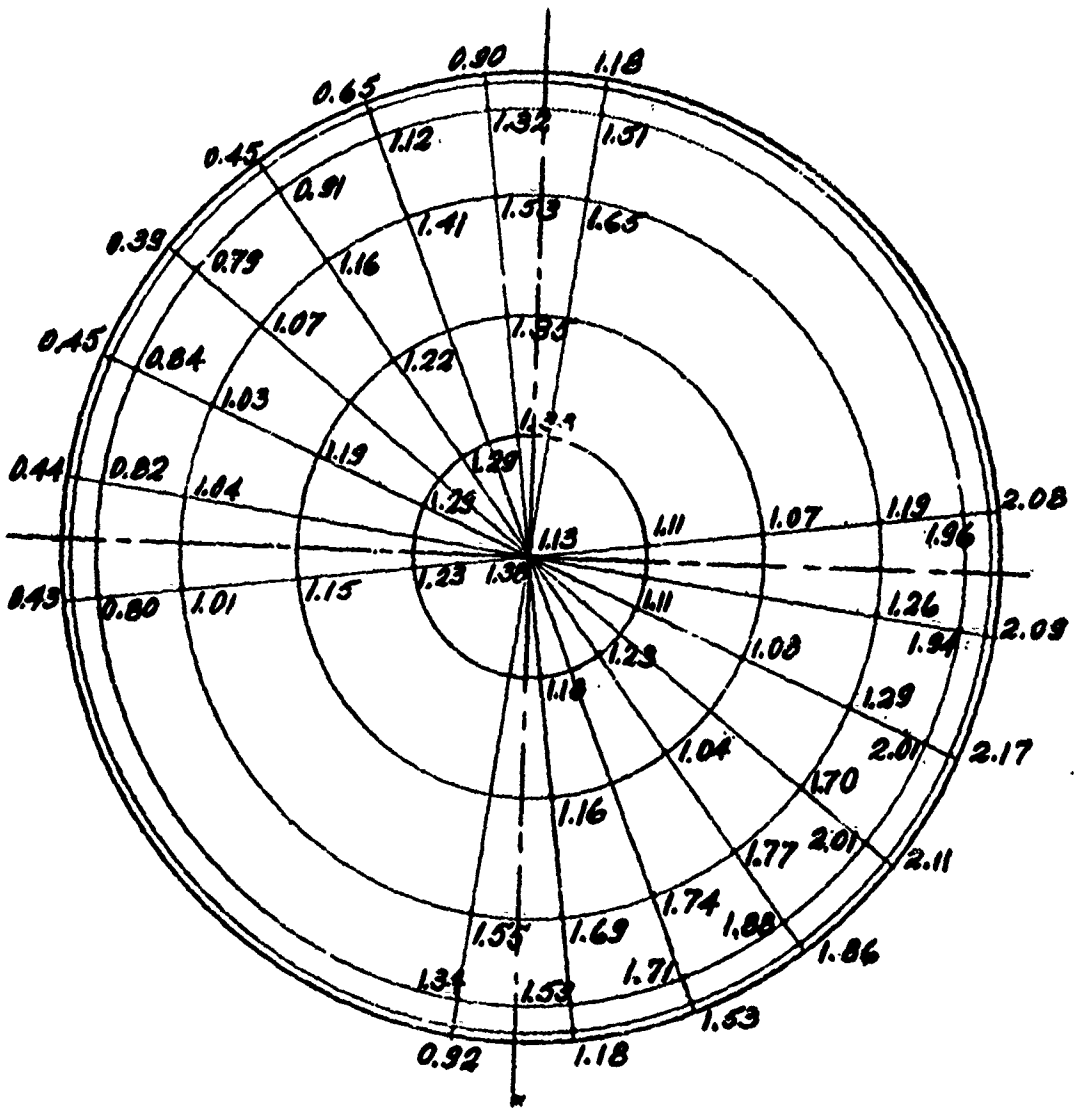
Fig. 6



LOADING COEFFICIENTS: $C_{P_{front}} - C_{P_{rear}}$

$\psi = 0°, \quad \theta = 0°.$

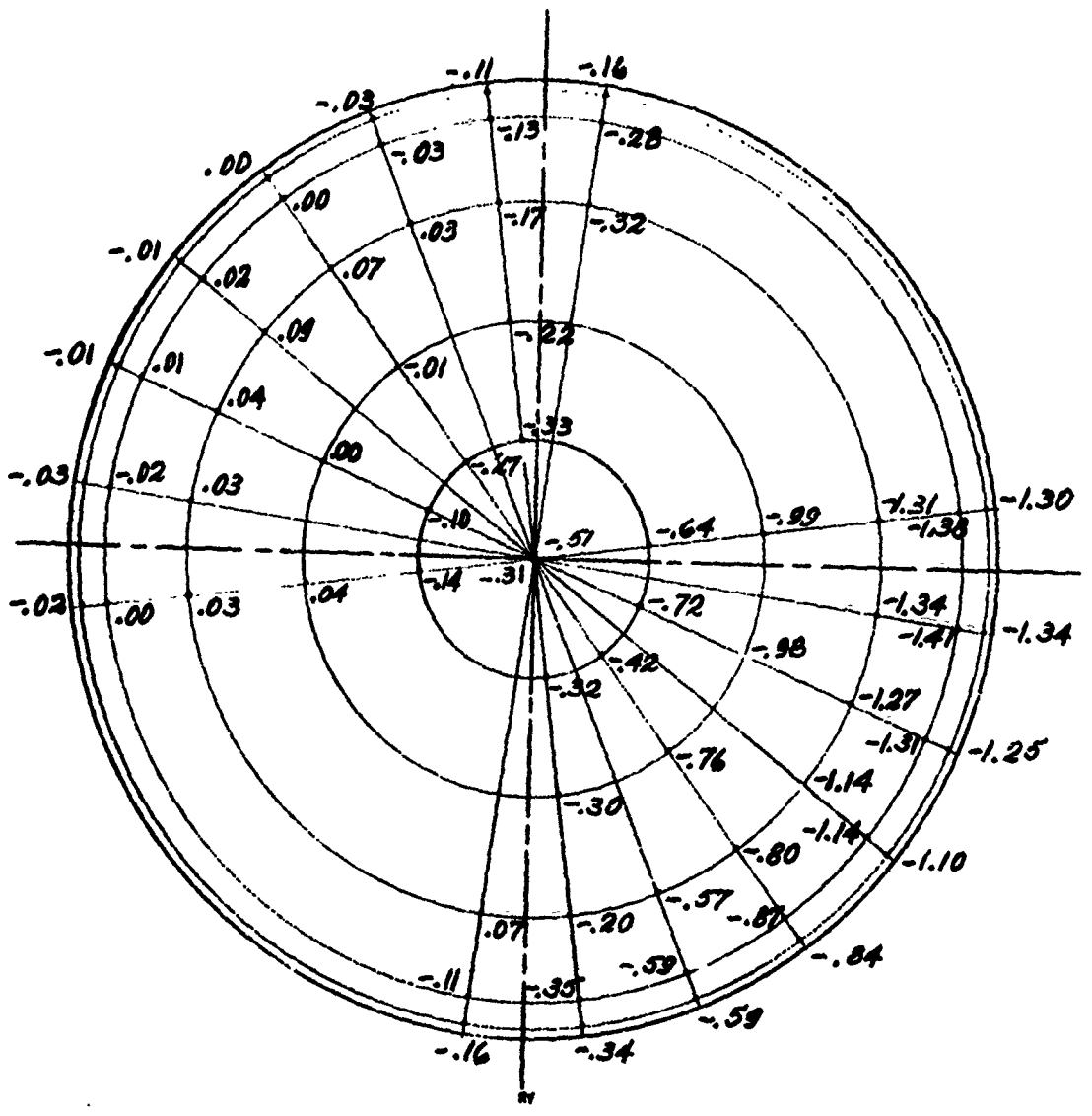
Fig. 7



LOADING COEFFICIENTS : $C_{P_{front}} - C_{P_{rear}}$

$\psi = 60°, \quad \Theta = 0°.$

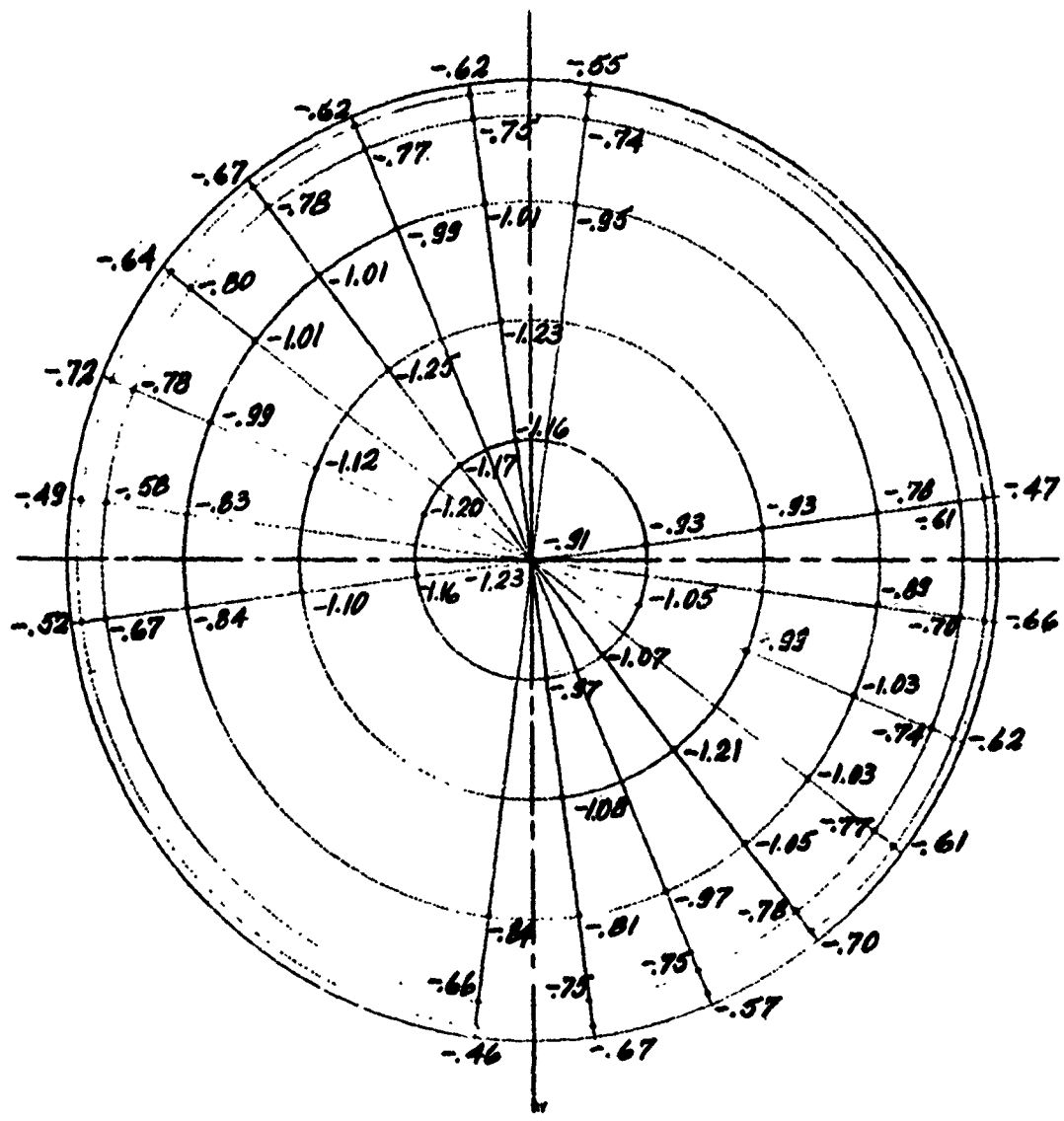
Fig. 8



LOADING COEFFICIENTS : $C_{P_{front}} - C_{P_{rear}}$

$\psi = 120°$, $\theta = 0°$.

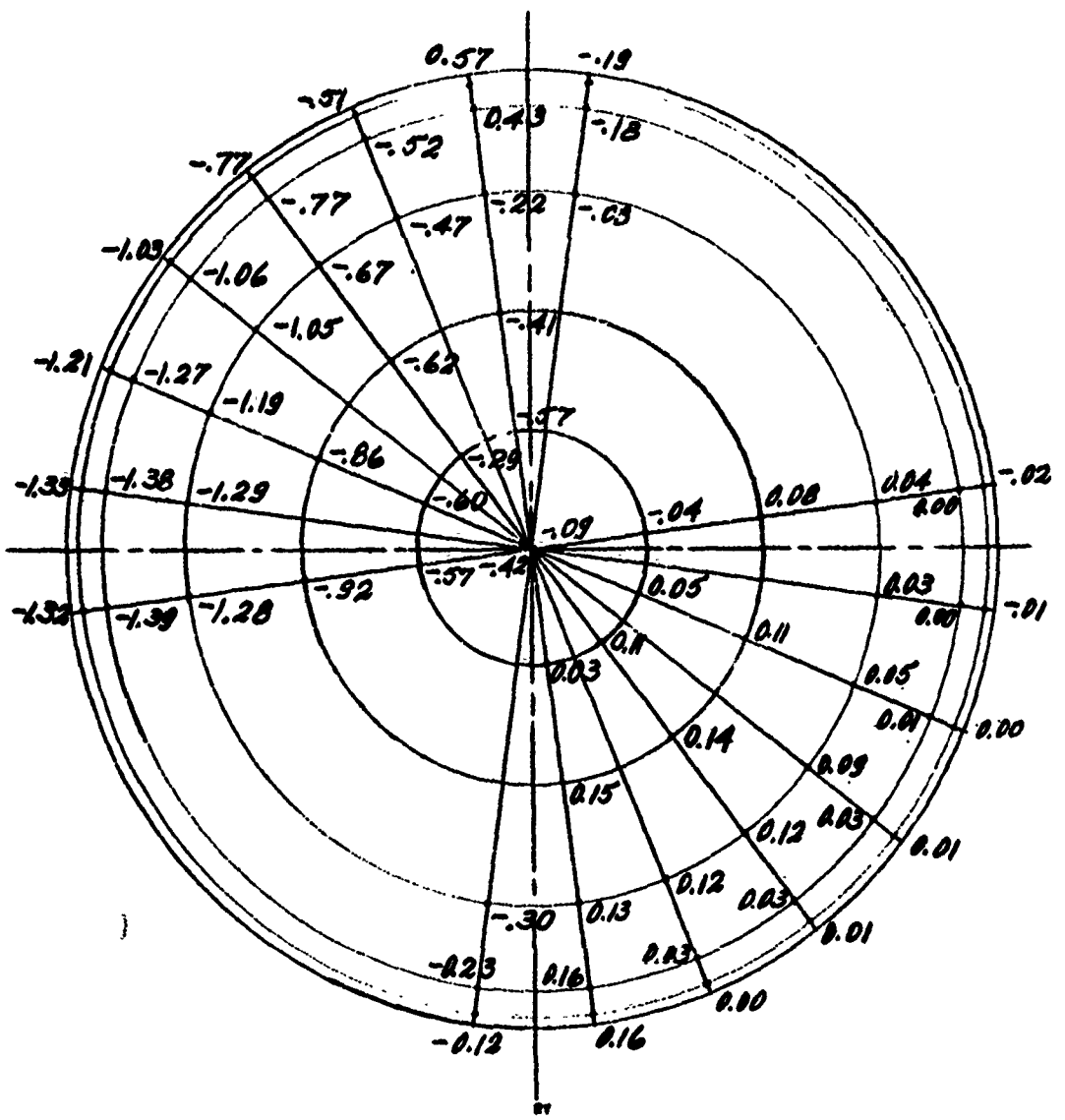
Fig. 9



LOADING COEFFICIENTS: $C_{p_{front}} - C_{p_{rear}}$

$\psi = 180°, \quad \theta = 0°.$

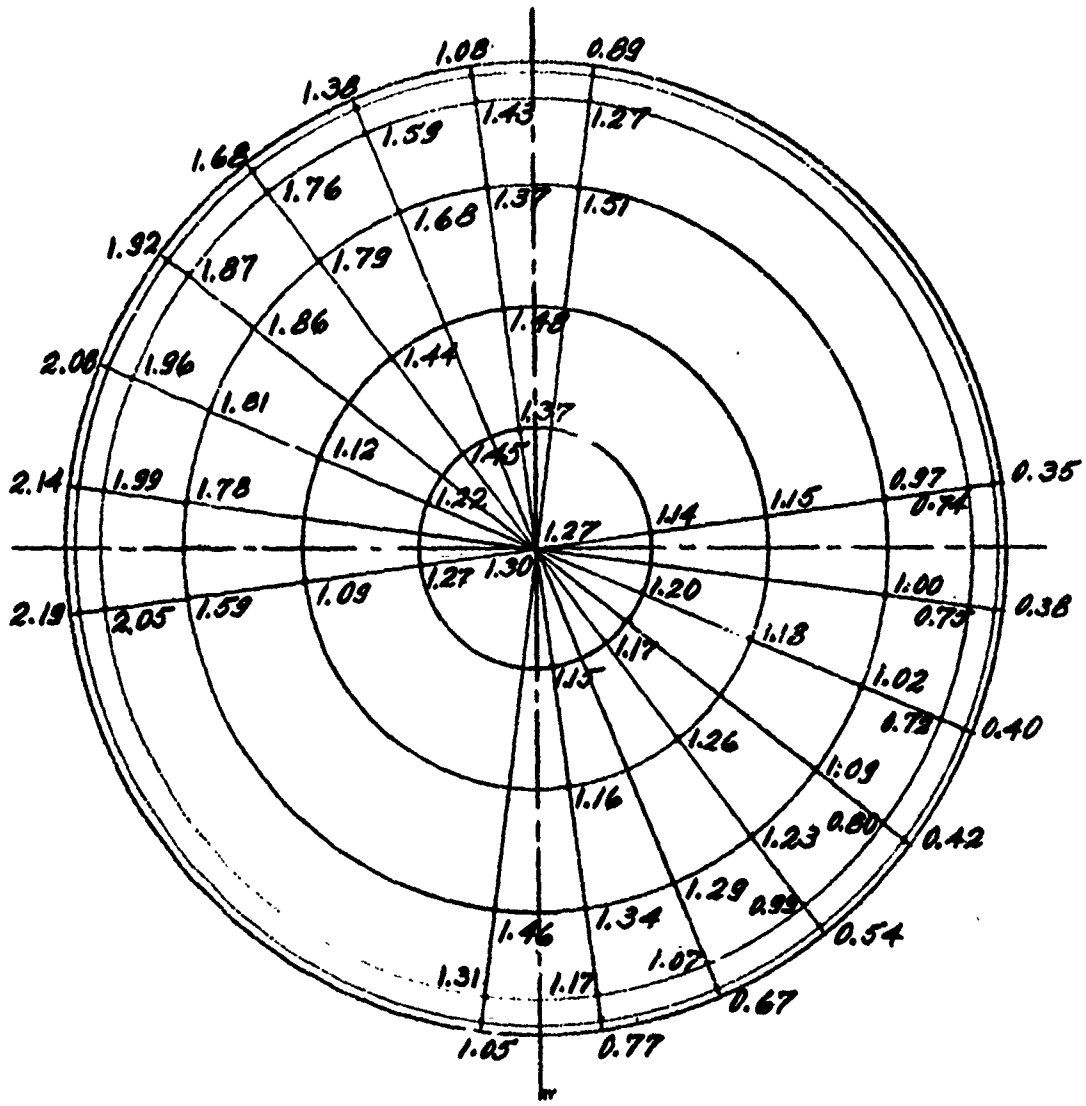
Fig. 10



LOADING COEFFICIENTS : $C_{P_{front}} - C_{P_{rear}}$

$\psi = 240°$, $\theta = 0°$.

Fig. 11



LOADING COEFFICIENTS : $C_{p_{front}} - C_{p_{rear}}$

$\psi = 300°$, $\theta = 0°$.

Fig. 12

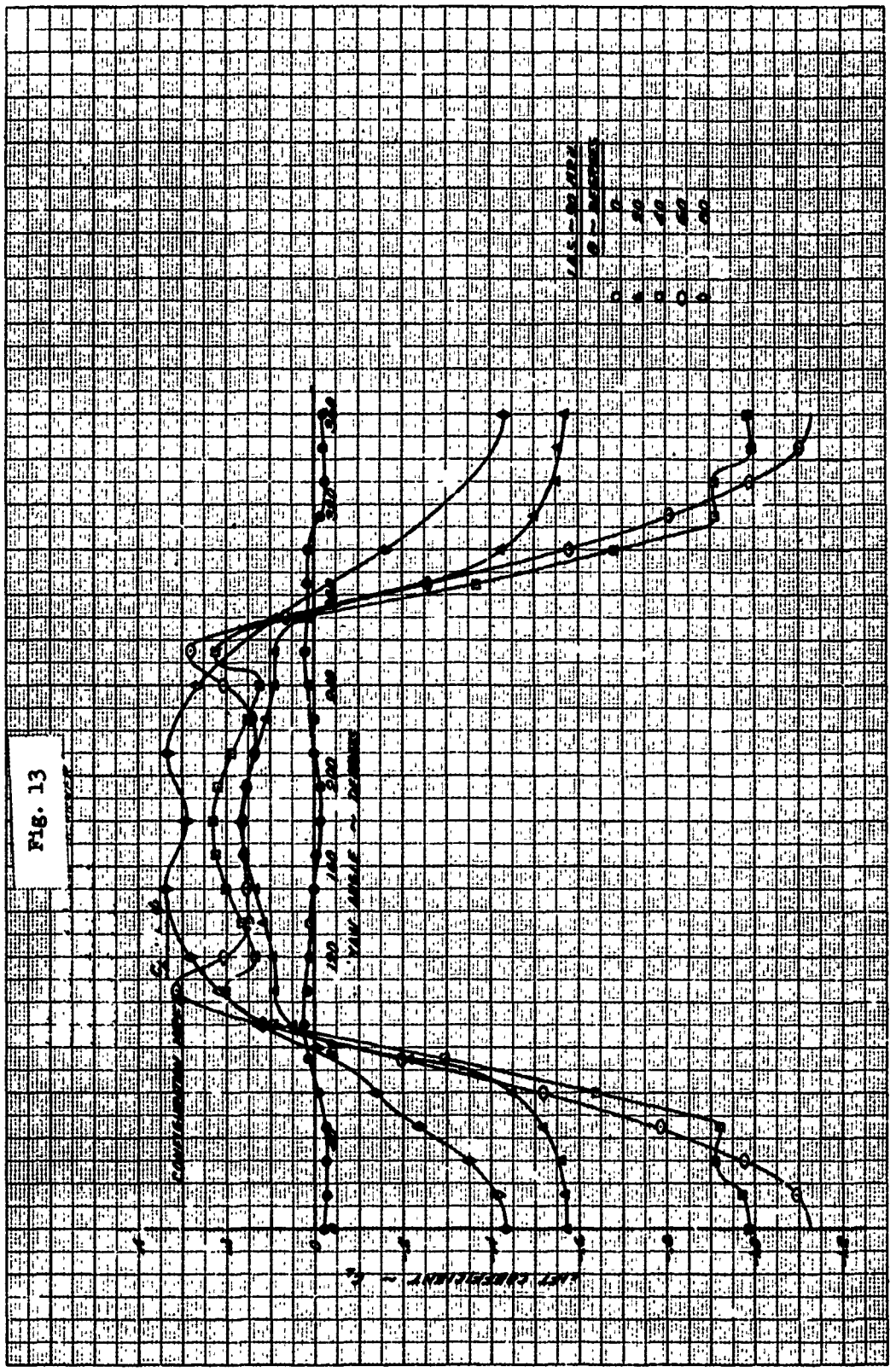


Fig. 13

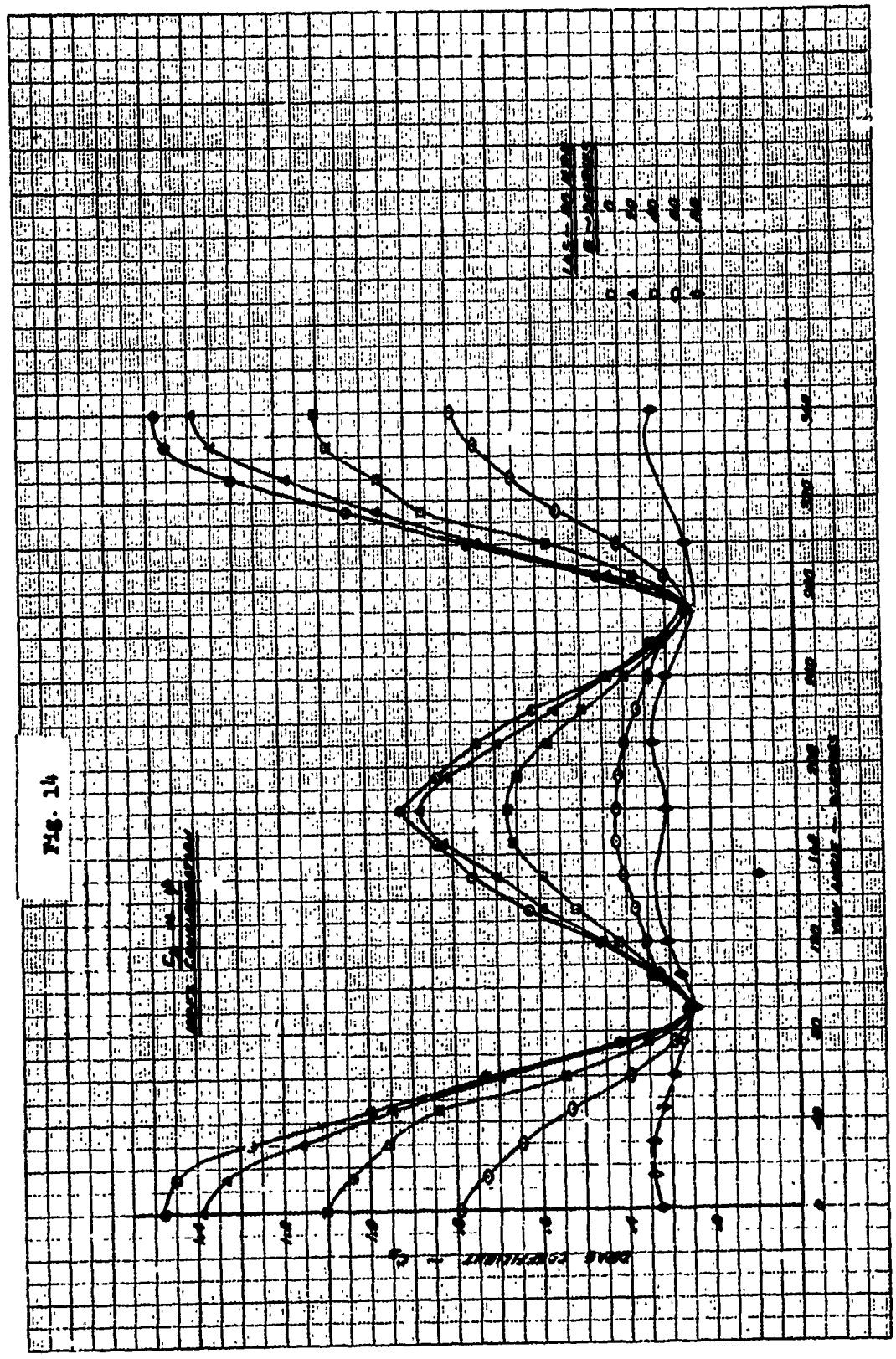


FIG. 14

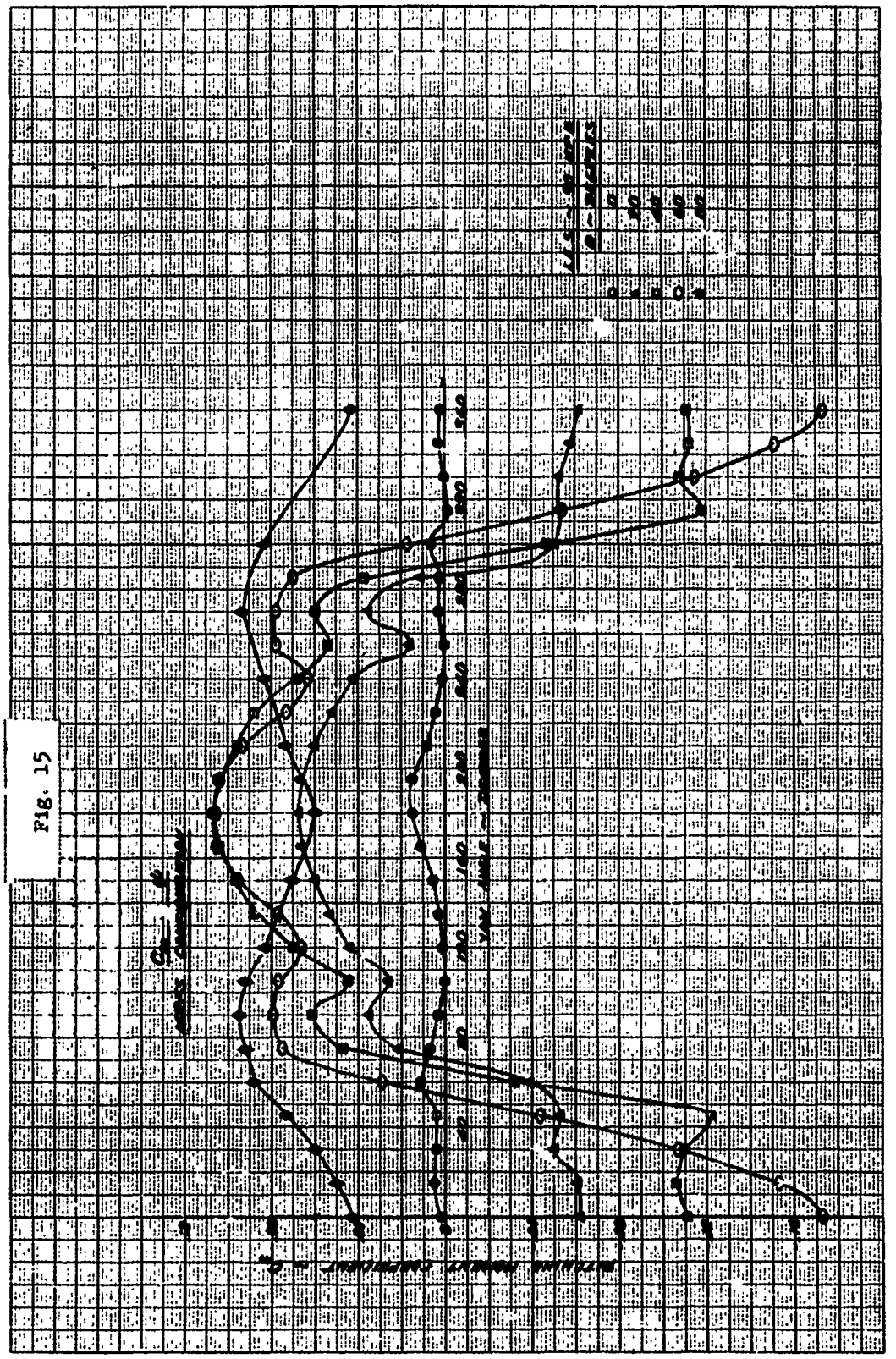


Fig. 15

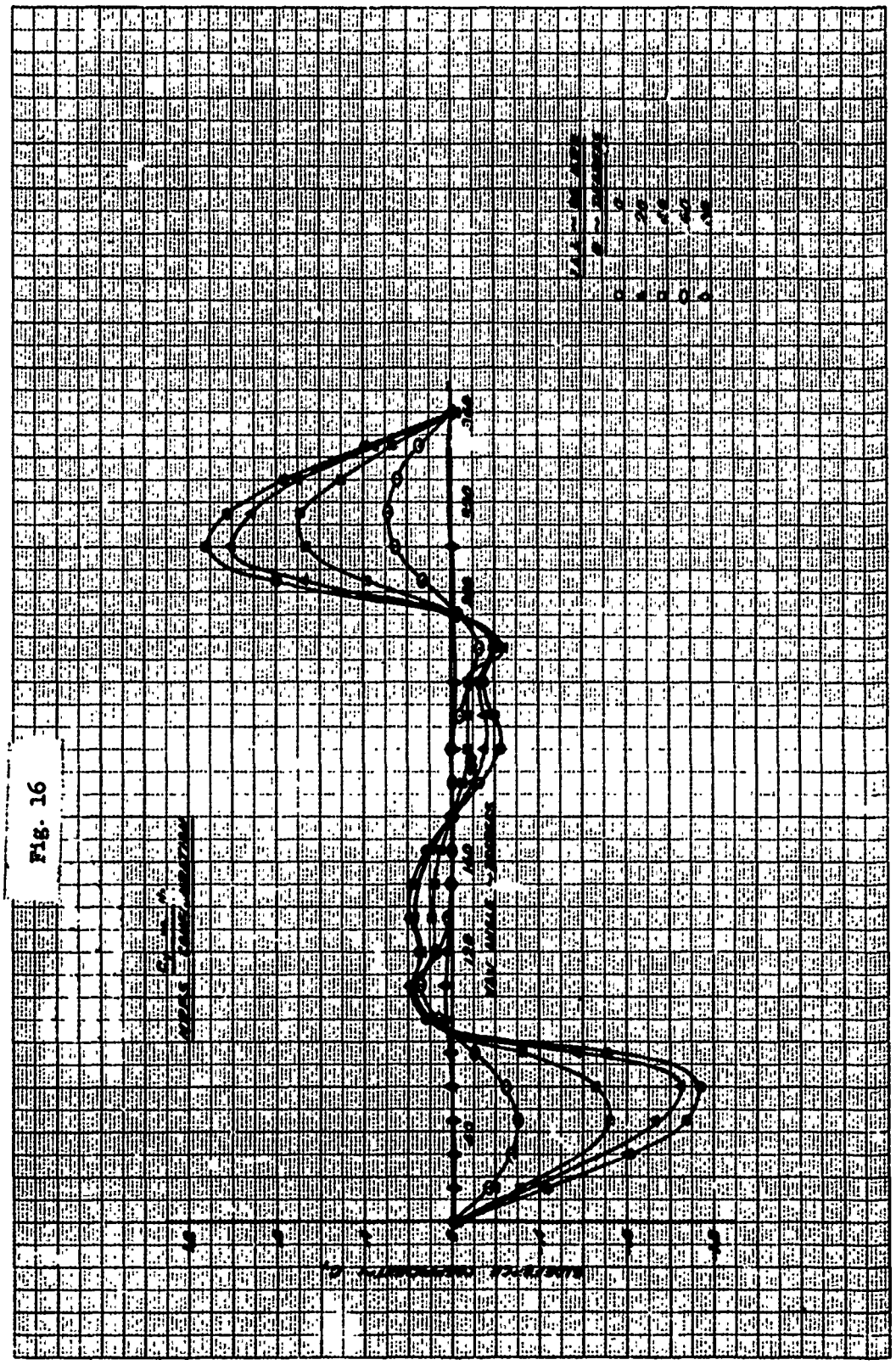


Fig. 16

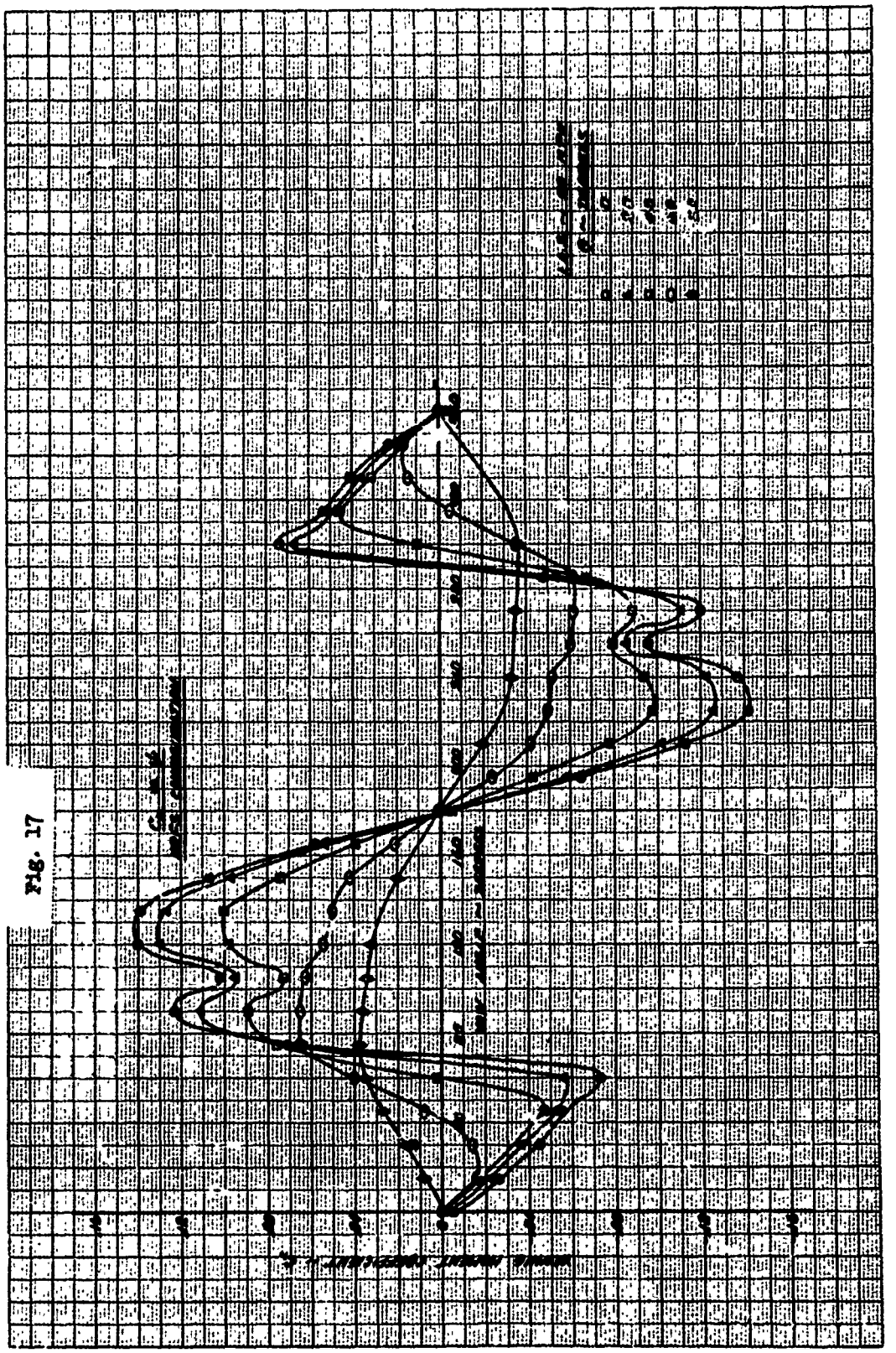
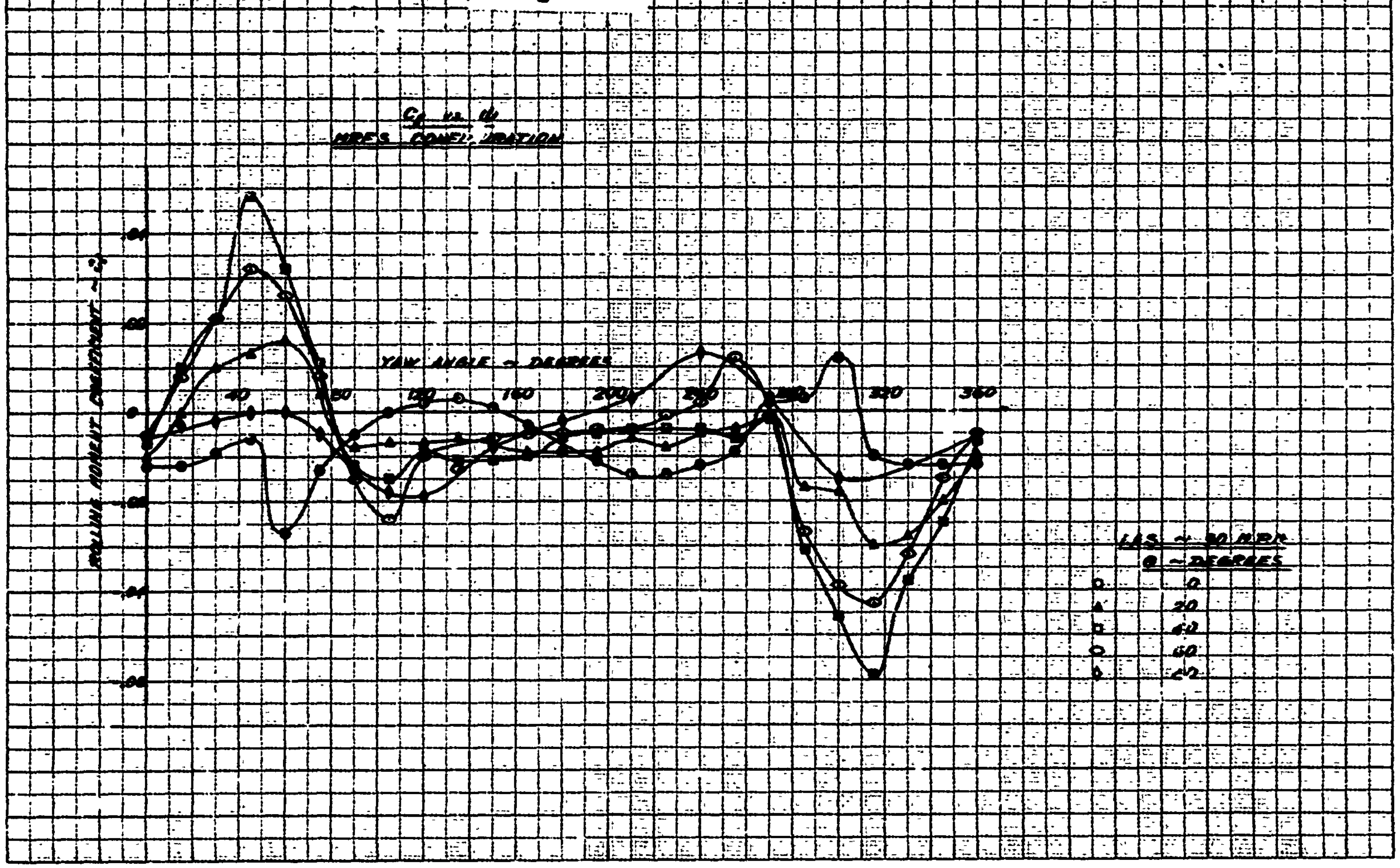


Fig. 17

Fig. 18


YAW ANGLE ~ DEGREES
40
80
120
160
200
240
280
320
360
.04
.02
0
-.02
-.04
-.06
I.A.S. ~ 30 M.P.H.
θ ~ DEGREES
0
20
40
60

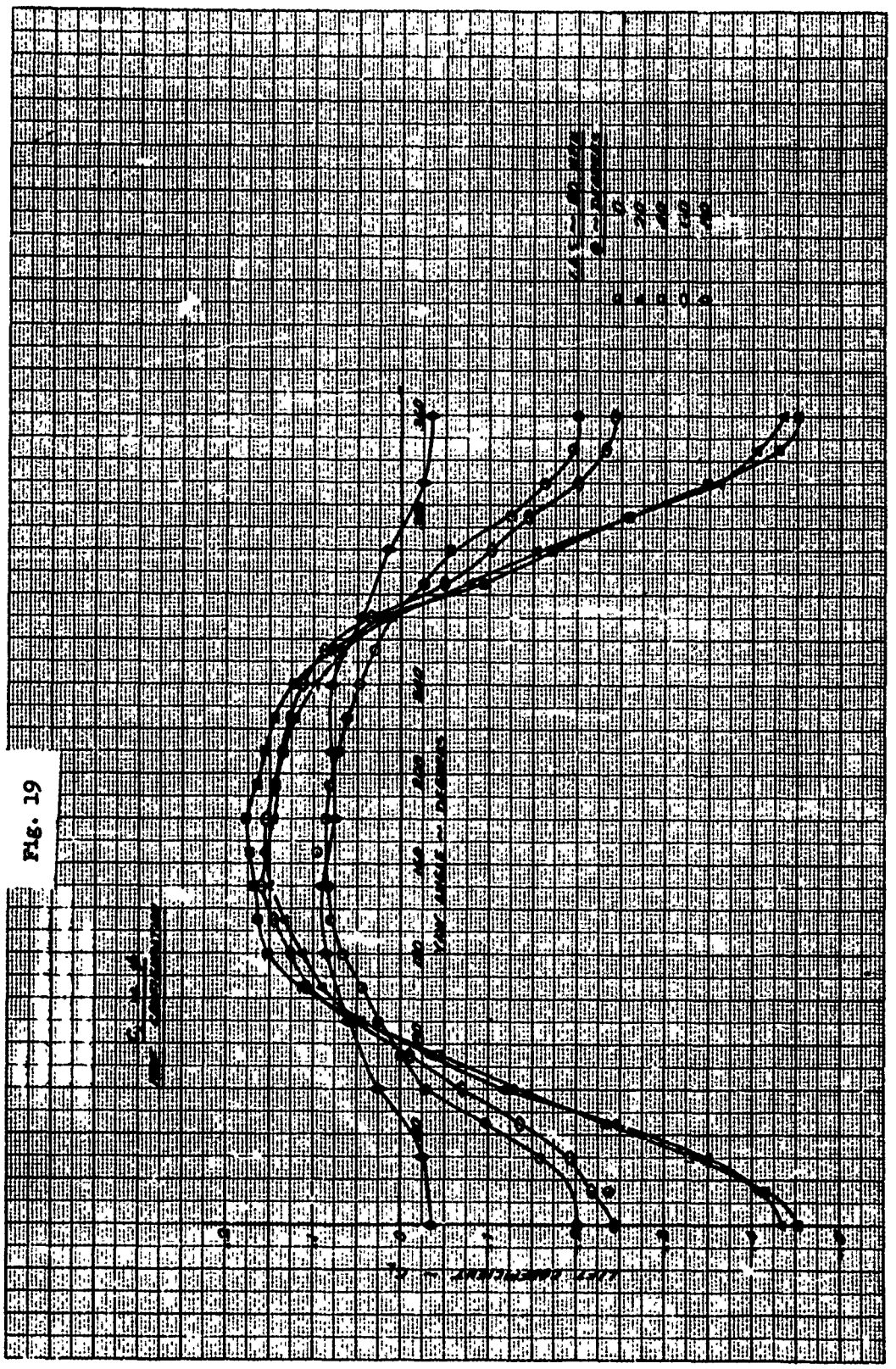


Fig. 19

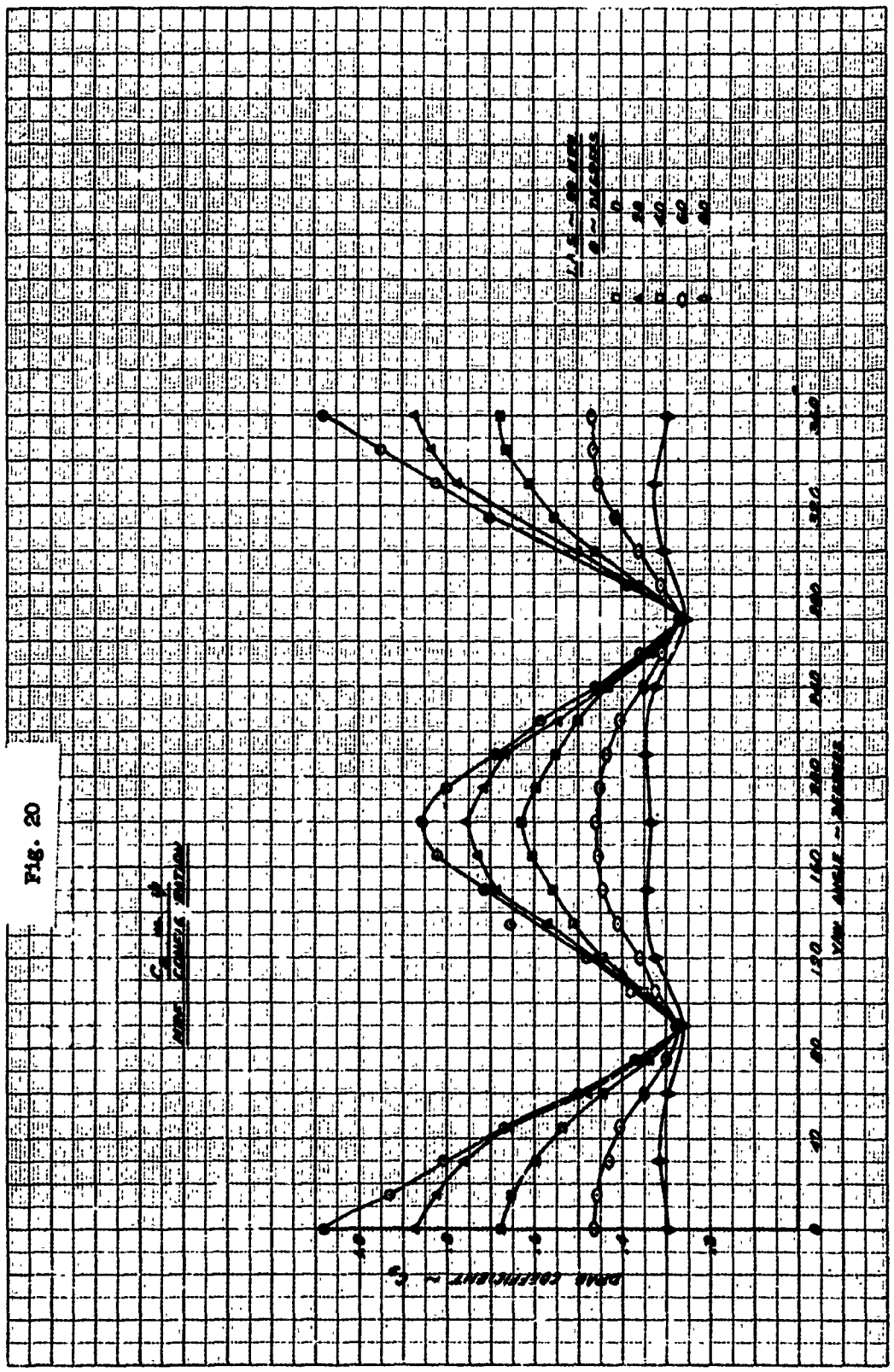

YAW ANGLE - DEGREES
0
30
60
90
120
150
180
YAW ANGLE - DEGREES
90
60
30
0
-30
-60
-90
YAWING COEFFICIENT - C_n
$C_n = \frac{\text{YAWING MOMENT}}{q \times \text{WING AREA} \times \text{WING SPAN}}$

FIG. 20

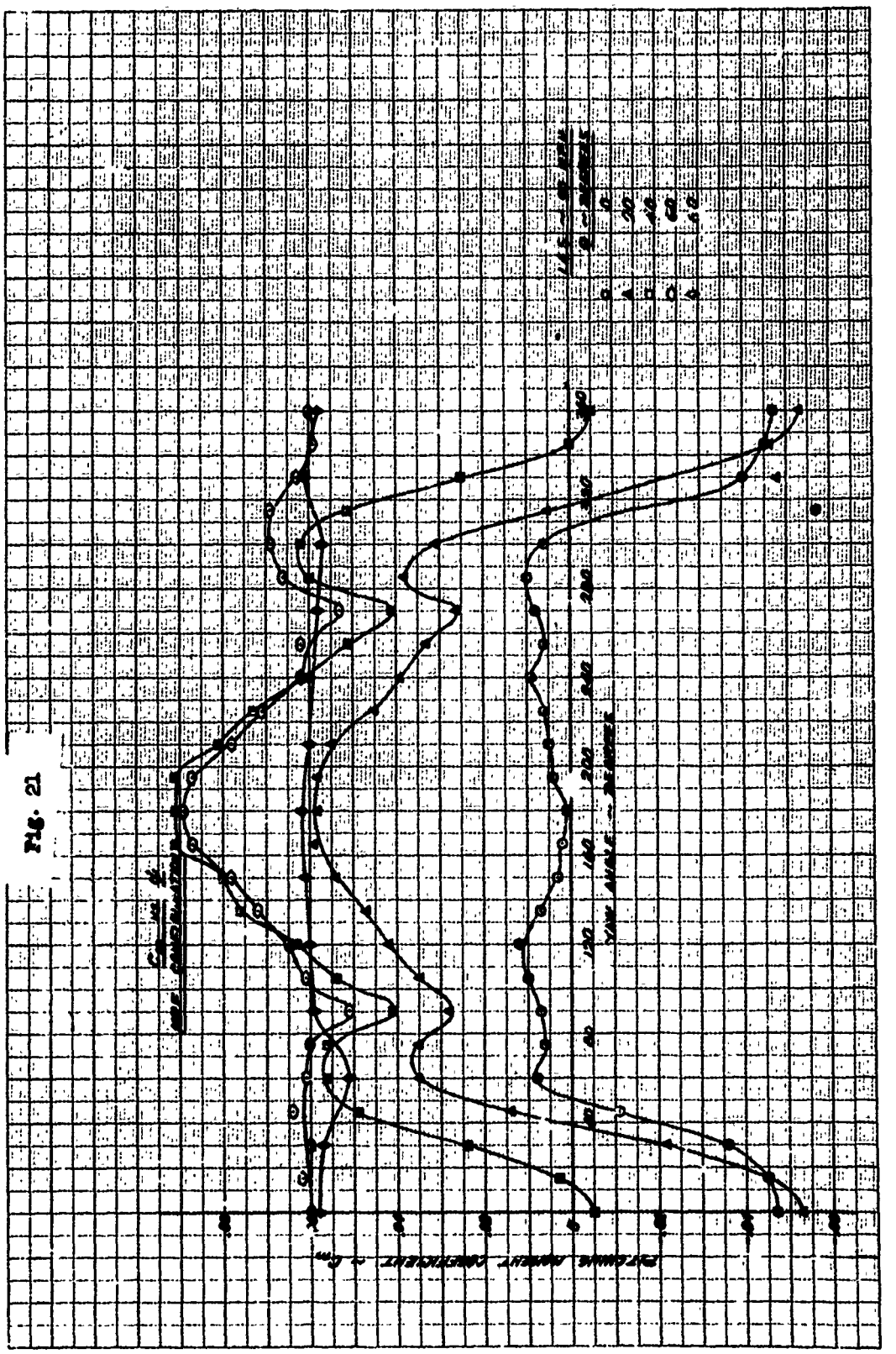
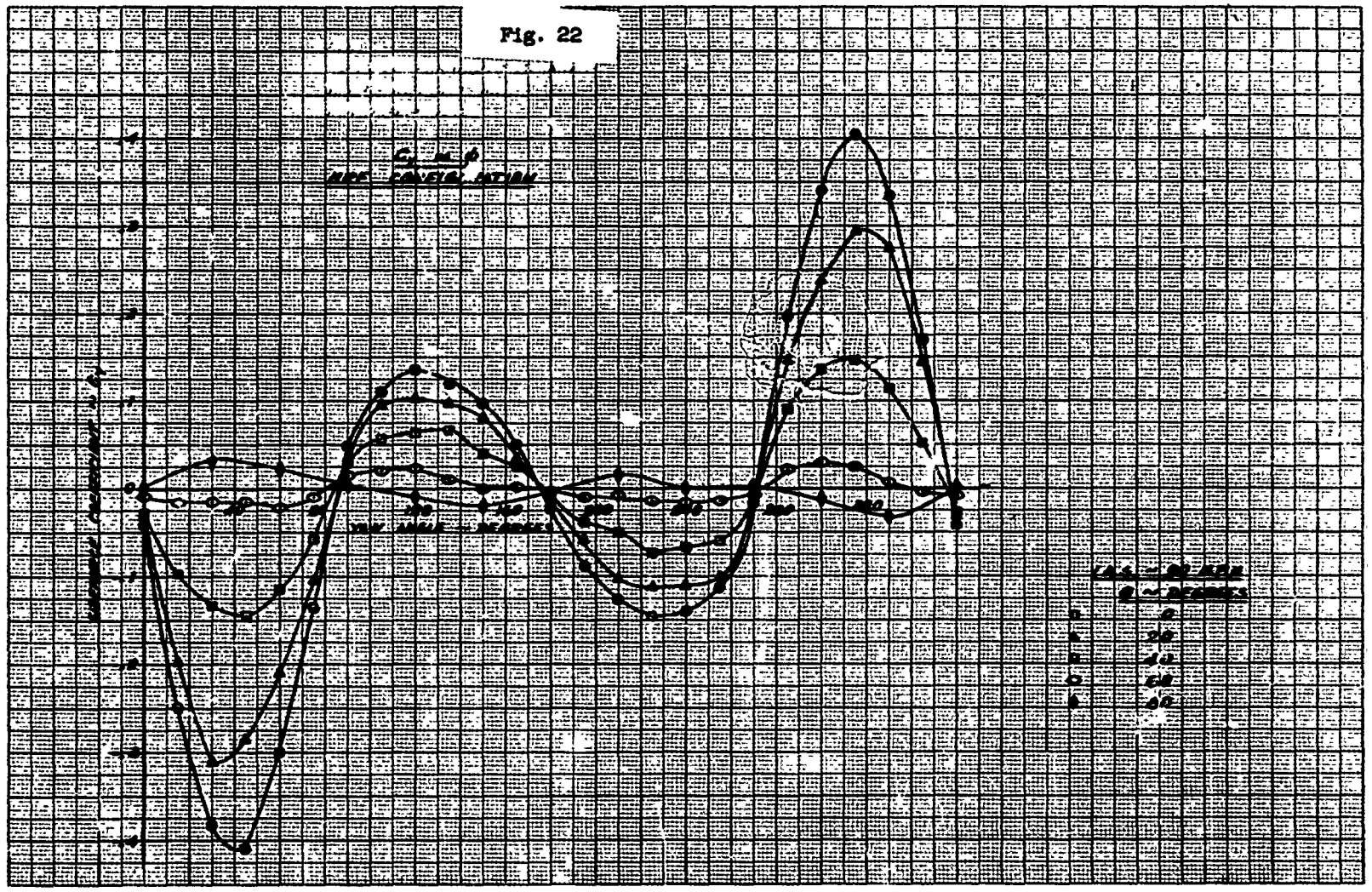


Fig. 21

Fig. 22



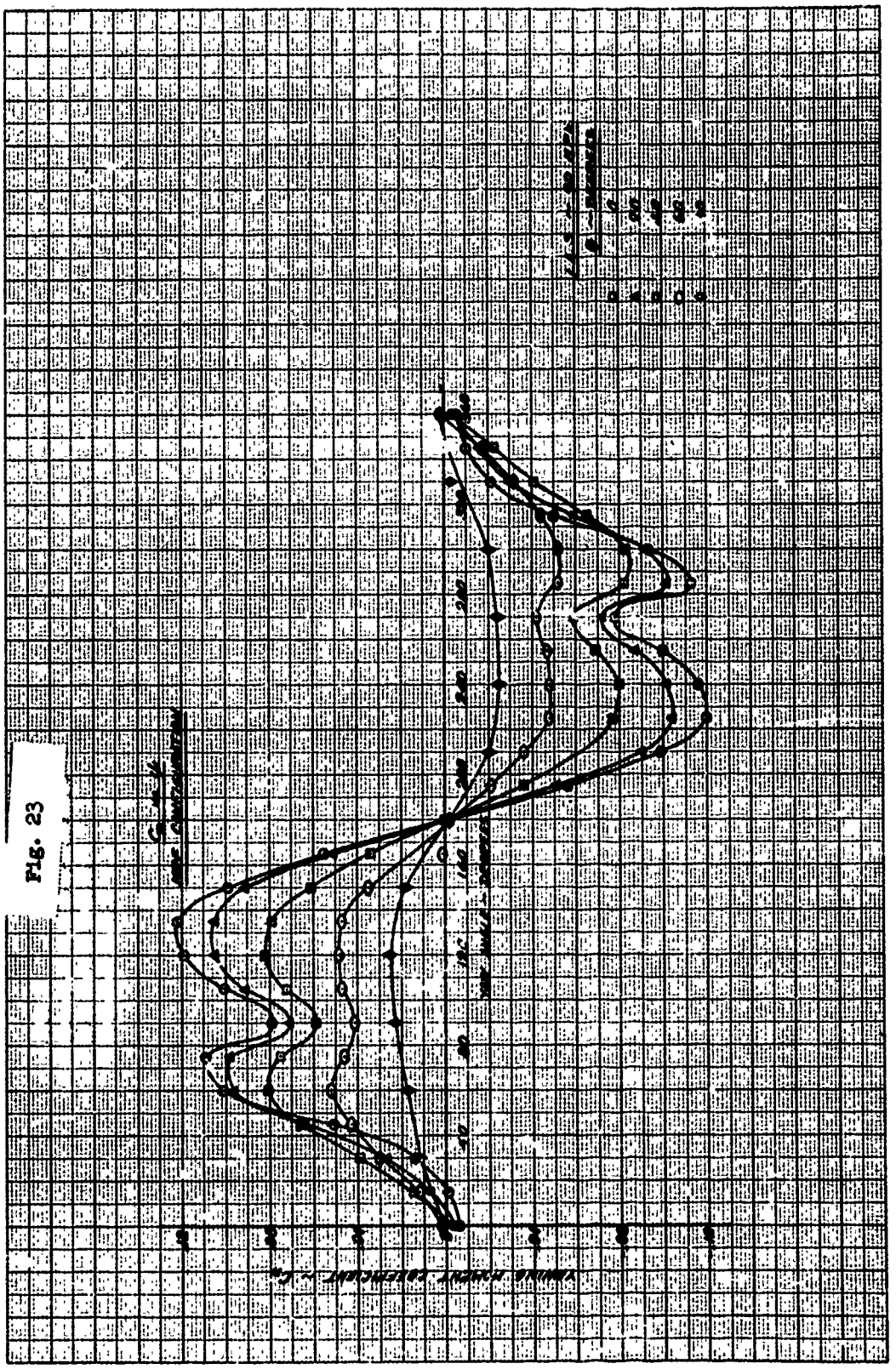


Fig. 23

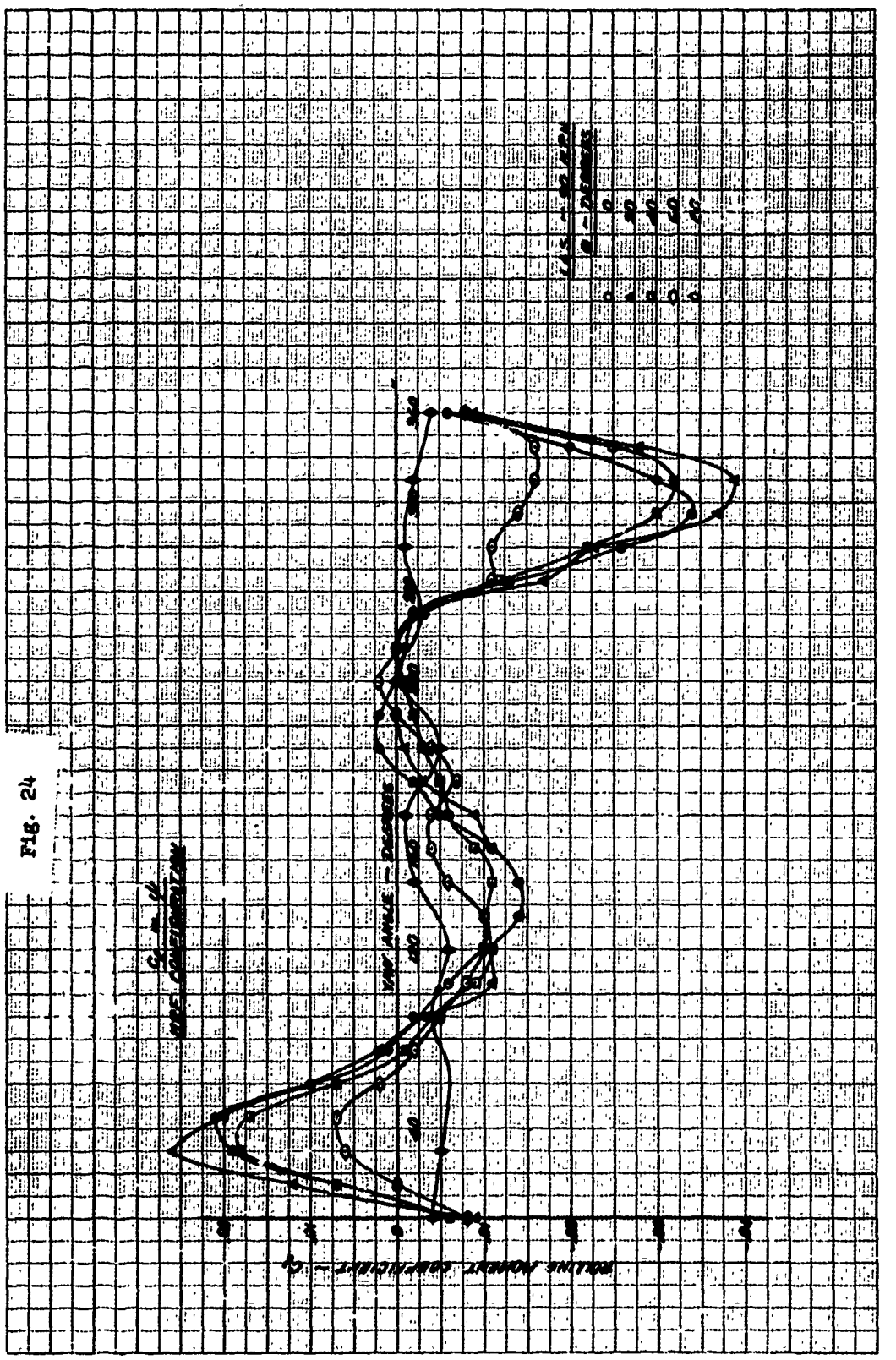

ROLLING MOMENT COEFFICIENT - C_l
YAW ANGLE - DEGREES
ψ
C_l vs ψ
ARC CONFIGURATION

Fig. 24

TABLE 1

TEST NO. 1015 RUN NO. 1

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\Psi = 0$ $\alpha = \pi$

TAP No.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP No.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
C	.95	-.57	1.52	44	.75	-.58	1.33
11	.94	-.57	1.51	45	.73	-.57	1.30
13	.94	-.58	1.52	46	.72	-.57	1.29
15	.96	-.57	1.53	47	.71	-.57	1.28
17	.95	-.56	1.51	48	.76	-.57	1.33
21	.95	-.58	1.53	51	.38	-.56	.94
23	.92	-.58	1.50	52	.40	-.57	.97
25	.92	-.58	1.50	53	.41	-.57	.98
27	.92	-.58	1.50	54	.34	-.57	.91
31	.98	-.57	1.55	55	.29	-.57	.86
32	.96	-.58	1.54	56	.29	-.57	.86
33	.92	-.58	1.50	57	.29	-.57	.86
34	.89	-.58	1.47	58	.37	-.56	.93
35	.88	-.58	1.46				
36	.88	-.58	1.46				
37	.88	-.58	1.46				
38	.90	-.58	1.48				
41	.82	-.57	1.39				
42	.82	-.57	1.39				
43	.79	-.57	1.36				

TABLE 2

TEST NO. 1015 RUN NO. 2

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH. Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\psi = 30°$ $\beta = .11$

TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_p	TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_p
C	.94	-.74	1.68	44	.48	-.68	1.16
11	.92	-.74	1.66	45	.53	-.70	1.23
13	.92	-.74	1.66	46	.60	-.72	1.32
15	.93	-.75	1.68	47	.64	-.73	1.37
17	.94	-.75	1.69	48	.73	-.72	1.45
21	.86	-.71	1.57	51	-.01	-.59	.58
23	.86	-.72	1.58	52	.01	-.58	.59
25	.88	-.73	1.61	53	.05	-.61	.66
27	.91	-.75	1.66	54	-.01	-.65	.64
31	73	-.64	1.37	55	.01	-.68	.69
32	.75	-.64	1 39	56	.11	-.71	.82
33	.75	-.66	1.41	57	.17	-.71	.88
34	.77	-.69	1.46	58	.33	-.71	1.04
35	.79	-.72	1.51				
36	.82	-.73	1.55				
37	.86	-.75	1.61				
38	.90	-.74	1.64				
41	.46	-.61	1.07				
42	.47	-.62	1.09				
43	.47	-.65	1.12				

TABLE 3

TEST NO. 1015 RUN NO. 3

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\Psi = 60°$ $Q = \pi$

TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
C	.74	-.64	1.38	44	.22	-.57	.79
11	.72	-.51	1.23	45	.32	-.59	.91
13	.72	-.57	1.29	46	.37	-.75	1.12
15	.73	-.56	1.29	47	.42	-.90	1.32
17	.73	-.60	1.33	48	.53	-.98	1.51
21	.63	-.52	1.15	51	-.12	-.55	.43
23	.64	-.55	1.19	52	-.05	-.49	.44
25	.65	-.57	1.22	53	-.06	-.51	.45
27	.69	-.66	1.35	54	-.19	-.58	.39
31	.49	-.52	1.01	55	-.14	-.59	.45
32	.52	-.52	1.04	56	-.07	-.72	.65
33	.52	-.51	1.03	57	.02	-.88	.90
34	.53	-.54	1.07	58	.22	-.96	1.18
35	.57	-.59	1.16				
36	.60	-.81	1.41				
37	.63	-.90	1.53				
38	.68	-.97	1.65				
41	.25	-.55	.80				
42	.27	-.55	.82				
43	.25	-.59	.84				

TABLE 4

TEST NO. 1015 RUN NO. 4

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH. Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\psi = 90°$ $\alpha = II$

TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
C	-.42	-.42	0	44	.21	-.20	.41
11	-.34	-.28	-.06	45	.15	-.19	.34
13	-.32	-.31	-.01	46	-.04	-.23	.19
15	-.35	-.27	-.08	47	-.36	-.28	-.08
17	-.41	-.28	-.13	48	-.41	-.29	-.12
21	-.09	-.23	.14	51	-.03	-.24	.21
23	-.07	-.22	.15	52	0	-.20	.20
25	-.21	-.26	.05	53	.04	-.22	.26
27	-.40	-.28	-.12	54	.05	-.19	.24
31	.13	-.23	.36	55	.03	-.19	.22
32	.21	-.21	.42	56	-.10	-.21	.11
33	.19	-.20	.39	57	-.35	-.29	-.06
34	.17	-.20	.37	58	-.40	-.32	-.08
35	.06	-.22	.28				
36	-.16	-.26	.10				
37	-.37	-.28	-.09				
38	-.44	-.23	-.21				
41	.13	-.24	.37				
42	.17	-.22	.39				
43	.18	-.22	.40				

TABLE 5

TEST NO. 1015 RUN NO. 5

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\Psi = 120°$ Q = II

TAP No.	C_p FRONT	C_p REAR	ΔC_p	TAP No.	C_p FRONT	C_p REAR	ΔC_p
C	-.41	-.10	-.31	44	-.43	-.45	.02
11	-.41	-.27	-.14	45	-.42	-.42	0
13	-.41	-.31	-.10	46	-.42	-.39	-.03
15	-.41	-.14	-.27	47	-.41	-.28	-.13
17	-.41	-.09	-.33	48	-.41	-.13	-.28
21	-.42	-.46	.04	51	-.47	-.45	-.02
23	-.42	-.42	0	52	-.47	-.44	-.03
25	-.41	-.40	-.01	53	-.46	-.45	-.01
27	-.41	-.19	-.22	54	-.44	-.43	-.01
31	-.43	-.46	.03	55	-.42	-.42	0
32	-.43	-.46	.03	56	-.42	-.39	-.03
33	-.42	-.46	.04	57	-.41	-.30	-.11
34	-.42	-.51	.09	58	-.41	-.25	-.16
35	-.41	-.48	.07				
36	-.41	-.44	.03				
37	-.41	-.24	-.17				
38	-.40	-.08	-.32				
41	-.45	-.45	0				
42	-.46	-.44	-.02				
43	-.44	-.45	.01				

TABLE 6

TEST NO. 1015 RUN NO. 6

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH. Sq _____ Sqc _____ Sqh _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\psi = 150°$ $Q = \infty$

TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
C	-.38	.49	-.87	44	-.37	-.10	-.27
11	-.38	.29	-.67	45	-.38	-.07	-.31
13	-.38	.28	-.66	46	-.38	-.01	-.37
15	-.38	.47	-.85	47	-.38	.08	-.46
17	-.38	.58	-.96	48	-.39	.23	-.62
21	-.39	.09	-.48	51	-.37	-.18	-.19
23	-.38	.10	-.48	52	-.37	-.21	-.16
25	-.37	.23	-.60	53	-.37	-.19	-.18
27	-.38	.47	-.85	54	-.37	-.19	-.18
31	-.37	-.07	-.30	55	-.38	-.14	-.24
32	-.37	-.08	-.29	56	-.38	-.05	-.33
33	-.37	-.05	-.32	57	-.39	-.01	-.38
34	-.37	-.07	-.30	58	-.39	.08	-.47
35	-.37	0	-.37				
36	-.38	.10	-.48				
37	-.38	.23	-.61				
38	-.38	.37	-.75				
41	-.37	-.15	-.22				
42	-.37	-.17	-.20				
43	-.37	-.16	-.21				

TABLE 7

TEST NO. 1015 RUN NO. 7

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\Psi = 180°$ $Q = \pi$

TAP No	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP No.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
C	-.37	.86	-1.23	44	-.37	.43	-.80
11	-.37	.79	-1.16	45	-.37	.41	-.78
13	-.37	.83	-1.20	46	-.37	.40	-.77
15	-.37	.80	-1.17	47	-.37	.38	-.75
17	-.37	.79	-1.16	48	-.37	.37	-.74
21	-.38	.72	-1.10	51	-.38	.14	-.52
23	-.37	.75	-1.12	52	-.38	.11	-.49
25	-.37	.88	-1.25	53	-.38	.34	-.72
27	-.37	.86	-1.23	54	-.38	.26	-.64
31	-.37	.47	-.84	55	-.37	.30	-.67
32	-.38	.45	-.83	56	-.37	.25	-.62
33	-.37	.62	-.99	57	-.37	.25	-.62
34	-.37	.64	-1.01	58	-.37	.18	-.55
35	-.37	.64	-1.01				
36	-.37	.62	-.99				
37	-.37	.64	-1.01				
38	-.37	.58	-.95				
41	-.38	.29	-.67				
42	-.38	.20	-.58				
43	-.37	.41	-.78				

TABLE 8

TEST NO. 1015 RUN NO. 8

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\psi = 210°$ R = II

TAP NO	C_p FRONT	C_p REAR	ΔC_p	TAP NO.	C_p FRONT	C_p REAR	ΔC_p
C	-.38	.63	-1.01	44	-.37	.69	-1.06
11	-.38	.74	-1.12	45	-.37	.56	-.93
13	-.38	.74	-1.12	46	-.38	.41	-.79
15	-.38	.65	-1.03	47	-.38	.27	-.65
17	-.38	.62	-1.00	48	-.38	.14	-.52
21	-.38	.99	-1.37	51	-.37	.69	-1.06
23	-.38	.95	-1.33	52	-.37	.66	-1.03
25	-.38	.79	-1.17	53	-.37	.58	-.95
27	-.38	.58	-.96	54	-.37	.53	-.90
31	-.37	1.00	-1.37	55	-.38	.44	-.82
32	-.38	.98	-1.36	56	-.38	.29	-.67
33	-.38	.95	-1.33	57	-.38	.15	-.53
34	-.38	.86	-1.24	58	-.38	.04	-.42
35	-.37	.70	-1.07				
36	-.38	.53	-.91				
37	-.38	.33	-.71				
38	-.38	.21	-.59				
41	-.37	.85	-1.22				
42	-.37	.82	-1.19				
43	-.37	.77	-1.14				

TABLE 9

TEST NO. 1015 RUN NO. 9

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\Psi = 240°$ $Q = \pi$

TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
6	-.41	.01	-.42	44	-.40	.66	-1.06
11	-.40	.17	-.57	45	-.40	.37	-.77
13	-.40	.20	-.60	46	-.40	.11	-.52
15	-.41	-.12	-.29	47	-.41	-.84	.43
17	-.41	-.98	.57	48	-.41	-.23	-.18
21	-.40	.52	-.92	51	-.40	.92	-1.32
23	-.40	.46	-.86	52	-.40	.93	-1.33
25	-.41	.21	-.62	53	-.40	.81	-1.21
27	-.41	-.82	.41	54	-.40	.63	-1.03
31	-.42	.88	-1.29	55	-.40	.37	-.77
32	-.40	.89	-1.29	56	-.40	.11	-.51
33	-.40	.79	-1.19	57	-.41	-.98	.57
34	-.40	.65	-1.05	58	-.41	-.22	-.19
35	-.40	.27	-.67				
36	-.40	.07	-.47				
37	-.41	-.19	-.22				
38	-.41	-.33	-.08				
41	-.40	.99	-1.39				
42	-.39	.99	-1.38				
43	-.40	.87	-1.27				

TABLE 10

TEST NO. 1015 RUN NO. 10

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH. Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\psi = 270°$ $\Omega = II$

TAP NO.	$C_{p_{FRONT}}$	$C_{p_{REAR}}$	ΔC_p	TAP NO.	$C_{p_{FRONT}}$	$C_{p_{REAR}}$	ΔC_p
C	-.36	-.28	-.08	44	-.31	.13	-.44
11	-.35	-.13	-.22	45	-.33	.01	-.34
13	-.37	-.06	-.31	46	-.35	-.11	-.24
15	-.37	-.33	-.04	47	-.37	-.22	-.15
17	-.36	-.30	-.06	48	-.16	-.22	.06
21	-.31	.20	-.51	51	-.22	.98	-1.20
23	-.35	-.04	-.31	52	-.24	.94	-1.18
25	-.39	-.17	-.22	53	-.27	.81	-1.08
27	-.37	-.28	-.09	54	-.29	.60	-.89
31	-.26	.39	-.65	55	-.31	.33	-.64
32	-.28	.41	-.69	56	-.35	.03	-.38
33	-.31	.33	-.64	57	-.37	-.16	-.21
34	-.33	.21	-.54	58	-.18	-.18	0
35	-.36	-.13	-.23				
36	-.39	-.22	-.17				
37	-.39	-.35	-.04				
38	-.20	-.31	.11				
41	-.23	.37	-.60				
42	-.25	.53	-.78				
43	-.28	.37	-.65				

TABLE 11

TEST NO. 1015 RUN NO. 11

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\psi = 300°$ $\theta = \pi$

TAP No.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP No.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
C	.74	-.56	1.30	44	.78	-1.09	1.87
11	.76	-.51	1.27	45	.75	-1.01	1.76
13	.76	-.46	1.22	46	.66	-.93	1.59
15	.76	-.69	1.45	47	.55	-.88	1.43
17	.75	-.62	1.37	48	.44	-.83	1.27
21	.74	-.35	1.09	51	.92	-1.27	2.19
23	.75	-.37	1.12	52	.92	-1.22	2.14
25	.75	-.69	1.44	53	.91	-1.17	2.08
27	.74	-.74	1.48	54	.83	-1.09	1.92
31	.75	-.84	1.59	55	.67	-1.01	1.68
32	.76	-1.02	1.78	56	.46	-.92	1.38
33	.77	-1.04	1.81	57	.21	-.87	1.08
34	.77	-1.09	1.86	58	.07	-.82	.89
35	.75	-1.04	1.79				
36	.73	-.95	1.68				
37	.46	-.91	1.37				
38	.67	-.84	1.51				
41	.79	-1.26	2.05				
42	.80	-1.19	1.99				
43	.79	-1.17	1.96				

TABLE 12

TEST NO. 1015 RUN NO. 12

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\Psi = 330°$ $Q = \pi$

TAP No.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP No.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
C	.94	.75	.19	44	.94	.72	.22
11	.96	.72	.24	45	.88	.71	.17
13	.96	.73	.23	46	.81	.72	.09
15	.95	.73	.22	47	.71	.71	0
17	.94	.74	.20	48	.65	.71	-.06
21	.98	.73	.25	51	.79	.72	.05
23	.97	.73	.24	52	.80	.72	.08
25	.96	.73	.23	53	.76	.72	.04
27	.94	.73	.21	54	.66	.72	-.06
31	1.01	.72	.29	55	.53	.71	-.18
32	1.00	.72	.28	56	.43	.71	-.28
33	1.00	.73	.27	57	.28	.71	-.43
34	.98	.72	.26	58	.22	.71	-.49
35	.96	.72	.24				
36	.93	.72	.21				
37	.91	.72	.19				
38	.87	.73	.14				
41	1.01	.72	.29				
42	1.00	.72	.28				
43	.98	.72	.26				

TABLE 13

TEST NO. 1015 RUN NO. 13

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\Psi = 0$ $Q = IV$

TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP No.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
C	.93	-.60	1.53	44	.84	-.54	1.38
11	.93	-.60	1.53	45	.85	-.53	1.38
13	.94	-.59	1.53	46	.86	-.53	1.39
15	.94	-.57	1.51	47	.84	-.55	1.39
17	.43	-.57	1.00	48	.85	-.55	1.40
21	.85	-.60	1.45	51	.40	-.57	.97
23	1.00	-.57	1.57	52	.42	-.56	.98
25	.44	-.56	1.00	53	.45	-.55	1.00
27	.99	-.56	1.55	54	.43	-.53	.96
31	.99	-.59	1.58	55	.42	-.53	.95
32	.85	-.57	1.42	56	.44	-.53	.97
33	.46	-.56	1.02	57	.43	-.54	.97
34	.99	-.55	1.54	58	.46	-.54	1.00
35	1.00	-.54	1.54				
36	1.00	-.54	1.54				
37	1.00	-.55	1.55				
38	.99	-.55	1.54				
41	.83	-.57	1.40				
42	.83	-.57	1.40				
43	.83	-.55	1.38				

TABLE 14

TEST NO. 1015 RUN NO. 14

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH. Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\psi = 30°$ $\Omega = IV$

TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
C	.94	-.76	1.70	44	.97	-.73	1.70
11	.96	-.74	1.70	45	.92	-.72	1.64
13	.96	-.75	1.71	46	.85	-.72	1.57
15	.96	-.74	1.70	47	.77	-.73	1.50
17	.94	-.74	1.68	48	.68	-.72	1.40
21	.98	-.74	1.72	51	.82	-.73	1.55
23	.98	-.74	1.72	52	.83	-.73	1.56
25	.96	-.74	1.70	53	.81	-.73	1.54
27	.94	-.74	1.68	54	.72	-.73	1.45
31	1.01	-.74	1.75	55	.61	-.72	1.33
32	1.01	-.73	1.74	56	.50	-.72	1.22
33	1.00	-.73	1.73	57	.35	-.72	1.07
34	.99	-.73	1.72	58	.27	-.71	.98
35	.97	-.73	1.70				
36	.94	-.73	1.67				
37	.92	-.73	1.65				
38	.88	-.73	1.61				
41	1.02	-.73	1.75				
42	1.02	-.73	1.75				
43	1.00	-.73	1.73				

TABLE 15

TEST NO. 1015 RUN NO. 15

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqp _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\Psi = 60°$ $Q = IV$

TAP No.	$C_{p_{FRONT}}$	$C_{p_{REAR}}$	ΔC_p	TAP No.	$C_{p_{FRONT}}$	$C_{p_{REAR}}$	ΔC_p
C	.73	-.40	1.13	44	.76	-1.25	2.01
11	.75	-.36	1.11	45	.74	-1.14	1.88
13	.75	-.36	1.11	46	.67	-1.04	1.71
15	.75	-.48	1.23	47	.56	-.97	1.53
17	.74	-.44	1.18	48	.44	-.90	1.34
21	.73	-.34	1.07	51	.88	-1.20	2.08
23	.74	-.34	1.08	52	.87	-1.22	2.09
25	.73	-.31	1.04	53	.89	-1.28	2.17
27	.73	-.43	1.16	54	.84	-1.27	2.11
31	.73	-.46	1.19	55	.71	-1.15	1.86
32	.74	-.52	1.26	56	.50	-1.03	1.53
33	.75	-.54	1.29	57	.25	-.93	1.18
34	.94	-.76	1.70	58	.07	-.85	.92
35	.73	-1.04	1.77				
36	.71	-1.03	1.74				
37	.69	-1.00	1.69				
38	.66	-.89	1.55				
41	.77	-1.19	1.96				
42	.76	-1.18	1.94				
43	.77	-1.24	2.01				

TABLE 16

TEST NO. 1015 RUN NO. 16

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\psi = 90°$ $Q = IV$

TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
C	-.43	-.11	-.32	44	-.28	.32	-.60
11	-.41	-.04	-.37	45	-.29	.18	-.47
13	-.41	0	-.41	46	-.33	0	-.33
15	-.41	-.26	-.15	47	-.38	-.20	-.18
17	-.42	-.21	-.21	48	-.41	-.34	-.07
21	-.37	.07	-.44	51	-.30	.98	-1.28
23	-.37	.06	-.43	52	-.29	1.00	-1.29
25	-.38	-.01	-.37	53	-.67	.88	-1.55
27	-.43	-.22	-.21	54	-.26	.69	-.95
31	-.34	.43	-.77	55	-.28	.40	-.68
32	-.33	.48	-.81	56	-.32	.08	-.40
33	-.31	.42	-.73	57	-.37	-.16	-.21
34	-.31	.33	-.64	58	-.41	-.28	-.13
35	-.33	.04	-.37				
36	-.37	-.08	-.29				
37	-.41	-.33	-.08				
38	-.43	-.42	-.01				
41	-.31	.61	-.92				
42	-.29	.64	-.93				
43	-.28	.53	-.81				

TABLE 17

TEST NO. 1015 RUN NO. 17

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\Psi = 120°$ $Q = \pi$

TAP No.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP No.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
C	-.42	.09	-.51	44	-.41	.73	-1.14
11	-.41	.23	-.64	45	-.41	.46	-.87
13	-.42	.30	-.72	46	-.41	.18	-.59
15	-.42	0	-.42	47	-.42	-.07	-.35
17	-.41	-.09	-.32	48	-.42	-.31	-.11
21	-.41	.58	-.99	51	-.41	.89	-1.30
23	-.41	.57	-.98	52	-.41	.93	-1.34
25	-.41	.35	-.76	53	-.41	.84	-1.25
27	-.42	-.12	-.30	54	-.41	.69	-1.10
31	-.41	.90	-1.31	55	-.41	.43	-.84
32	-.41	.93	-1.34	56	-.41	.18	-.59
33	-.41	.86	-1.27	57	-.41	-.07	-.34
34	-.41	.73	-1.14	58	-.42	-.26	-.16
35	-.41	.39	-.80				
36	-.41	.16	-.57				
37	-.42	-.22	-.20				
38	-.42	-.49	+.07				
41	-.41	.97	-1.38				
42	-.40	1.01	-1.41				
43	-.41	.90	-1.31				

TABLE 18

TEST NO. 1015 RUN NO. 18

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH. Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\psi = 150°$ Q= IV

TAP NO.	$C_{p_{FRONT}}$	$C_{p_{REAR}}$	ΔC_p	TAP NO.	$C_{p_{FRONT}}$	$C_{p_{REAR}}$	ΔC_p
C	-.36	.63	-.99	44	-.37	.72	-1.09
11	-.34	.74	-1.08	45	-.38	.59	-.97
13	-.37	.76	-1.13	46	-.38	.41	-.79
15	-.38	.63	-1.01	47	-.38	.24	-.62
17	-.38	.62	-1.00	48	-.38	.08	-.46
21	-.35	.97	-1.32	51	-.36	.65	-1.01
23	-.37	.97	-1.34	52	-.32	.64	-.96
25	-.38	.80	-1.18	53	-.37	.60	-.97
27	-.38	.47	-.85	54	-.37	.51	-.88
31	-.35	.96	-1.31	55	-.38	.45	-.83
32	-.37	.99	-1.36	56	-.38	.30	-.68
33	-.37	.94	-1.31	57	-.38	.15	-.53
34	-.37	.88	-1.25	58	-.38	0	-.38
35	-.38	.73	-1.11				
36	-.38	.55	-.93				
37	-.38	.27	-.65				
38	-.38	.12	-.50				
41	-.35	.80	-1.15				
42	-.36	.80	-1.16				
43	-.36	.78	-1.14				

TABLE 19

TEST NO. 1015 RUN NO. 19

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqt _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\Psi = 180°$ $Q = III$

TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
C	-.35	.56	-.91	44	-.36	.41	-.77
11	-.33	.60	-.93	45	-.35	.43	-.78
13	-.36	.69	-1.05	46	-.35	.40	-.75
15	-.35	.72	-1.07	47	-.36	.39	-.75
17	-.35	.62	-.97	48	-.36	.30	-.66
21	-.34	.59	-.93	51	-.36	.11	-.47
23	-.36	.63	-.99	52	-.37	.29	-.66
25	-.35	.86	-1.21	53	-.36	.26	-.62
27	-.35	.73	-1.08	54	-.36	.25	-.61
31	-.34	.44	-.78	55	-.36	.34	-.70
32	-.36	.53	-.89	56	-.36	.21	-.57
33	-.35	.68	-1.03	57	-.36	.31	-.67
34	-.35	.68	-1.03	58	-.36	.10	-.46
35	-.35	.70	-1.05				
36	-.35	.62	-.97				
37	-.35	.46	-.81				
38	-.36	.48	-.84				
41	-.35	.26	-.61				
42	-.36	.34	-.70				
43	-.35	.39	-.74				

TABLE 20

TEST NO. 1015 RUN NO. 20

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\psi = 210°$ $R = IV$

TAP NO	C_p FRONT	C_p REAR	ΔC_p	TAP NO.	C_p FRONT	C_p REAR	ΔC_p
C	-.37	.26	-.63	44	-.36	-.14	-.22
11	-.36	.15	-.51	45	-.37	-.15	-.22
13	-.37	.10	-.47	46	-.37	-.03	-.34
15	-.36	.27	-.63	47	-.37	.01	-.38
17	-.37	.37	-.74	48	-.37	.17	-.54
21	-.37	-.05	-.32	51	-.37	-.25	-.12
23	-.37	-.03	-.34	52	-.37	-.24	-.13
25	-.36	.12	-.48	53	-.36	-.22	-.14
27	-.37	.31	-.68	54	-.36	-.19	-.17
31	-.36	-.11	-.25	55	-.37	-.18	-.19
32	-.37	-.12	-.25	56	-.37	-.04	-.33
33	-.36	-.13	-.23	57	-.38	-.05	-.33
34	-.36	-.11	-.25	58	-.37	.05	-.42
35	-.36	-.06	-.30				
36	-.37	.04	-.41				
37	-.37	.17	-.54				
38	-.37	.34	-.71				
41	-.36	-.19	-.17				
42	-.37	-.22	-.15				
43	-.36	-.19	-.17				

TABLE 21

TEST NO. 1015 RUN NO. 21

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\Psi = 240°$ $\Theta = IV$

TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP NO.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
C	-.40	-.31	-.09	44	-.43	-.46	.03
11	-.40	-.36	-.04	45	-.41	-.49	.03
13	-.41	-.46	.05	46	-.40	-.43	.03
15	-.41	-.52	.11	47	-.39	-.55	.16
17	-.41	-.44	.03	48	-.39	-.16	-.23
21	-.41	-.49	.08	51	-.46	-.44	-.02
23	-.42	-.53	.11	52	-.45	-.44	-.01
25	-.41	-.55	.14	53	-.45	-.45	0
27	-.40	-.55	.15	54	-.44	-.45	.01
31	-.42	-.46	.04	55	-.42	-.43	.01
32	-.43	-.46	.03	56	-.41	-.41	0
33	-.42	-.47	.05	57	-.39	-.55	.16
34	-.42	-.51	.09	58	-.39	-.27	-.12
35	-.41	-.53	.12				
36	-.40	-.52	.12				
37	-.40	-.53	.13				
38	-.39	-.09	-.30				
41	-.44	-.44	0				
42	-.44	-.44	0				
43	-.44	-.45	.01				

TABLE 22

TEST NO. 1015 RUN NO. 22

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH. Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\psi = 270°$ $Q = IV$

TAP NO.	$C_{p_{FRONT}}$	$C_{p_{REAR}}$	ΔC_p	TAP NO.	$C_{p_{FRONT}}$	$C_{p_{REAR}}$	ΔC_p
C	-.36	-.43	.07	44	.04	-.24	.28
11	-.17	-.31	.14	45	-.10	-.28	.18
13	-.23	-.32	.09	46	-.25	-.35	.10
15	-.29	-.23	-.06	47	-.30	-.36	.06
17	-.34	-.24	-.10	48	-.29	-.24	-.05
21	.15	-.25	.40	51	-.02	-.22	.20
23	-.02	-.27	.25	52	-.02	-.24	.22
25	-.25	-.36	.11	53	-.02	-.27	.25
27	-.34	-.32	-.02	54	-.07	-.24	.17
31	.31	-.23	.54	55	-.16	-.28	.12
32	.27	-.24	.51	56	-.28	-.36	.08
33	.16	-.24	.40	57	-.33	-.36	.03
34	.03	-.25	.28	58	-.29	-.26	-.03
35	-.14	-.33	.19				
36	-.28	-.37	.09				
37	-.33	-.29	-.04				
38	-.32	-.15	-.17				
41	.18	-.23	.41				
42	.18	-.25	.43				
43	.12	-.26	.38				

TABLE 23

TEST NO. 1015 RUN NO. 23

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\Psi = 300°$ $Q = IV$

TAP No.	C_p FRONT	C_p REAR	ΔC_p	TAP No.	C_p FRONT	C_p REAR	ΔC_p
C	.74	-.53	1.27	44	.24	-.56	.80
11	.72	-.42	1.14	45	.33	-.66	.99
13	.73	-.47	1.20	46	.39	-.68	1.07
15	.74	-.43	1.17	47	.47	-.70	1.17
17	.74	-.41	1.15	48	.59	-.72	1.31
21	.64	-.51	1.15	51	-.09	-.44	.35
23	.66	-.52	1.18	52	-.09	-.47	.38
25	.67	-.59	1.26	53	-.10	-.50	.40
27	.71	-.45	1.16	54	-.14	-.56	.42
31	.50	-.47	.97	55	-.14	-.68	.54
32	.53	-.47	1.00	56	-.01	-.68	.67
33	.53	-.49	1.02	57	.09	-.68	.77
34	.54	-.55	1.09	58	.34	-.71	1.05
35	.59	-.64	1.23				
36	.61	-.68	1.29				
37	.65	-.69	1.34				
38	.70	-.76	1.46				
41	.27	-.47	.74				
42	.26	-.49	.75				
43	.23	-.49	.72				

TABLE 24

TEST NO. 1015 RUN NO. 24

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE MAY 1962

WIND SPEED 90 MPH Sq _____ Sqc _____ Sqb _____

NATURE OF TEST PRESSURE DISTRIBUTION

MODEL CONFIGURATION $\Psi = 330°$ $\Theta = \pi$

TAP No.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P	TAP No.	$C_{P_{FRONT}}$	$C_{P_{REAR}}$	ΔC_P
C	.94	-.72	1.66	44	.51	-.63	1.14
11	.91	-.71	1.62	45	.59	-.65	1.24
13	.92	-.71	1.63	46	.65	-.67	1.32
15	.92	-.72	1.64	47	.70	-.70	1.40
17	.93	-.71	1.64	48	.78	-.71	1.49
21	.87	-.69	1.56	51	.02	-.58	.60
23	.87	-.69	1.56	52	.04	-.57	.61
25	.88	-.69	1.57	53	.08	-.58	.66
27	.92	-.71	1.63	54	.05	-.60	.65
31	.73	-.63	1.36	55	.10	-.63	.73
32	.75	-.61	1.36	56	.18	-.66	.84
33	.76	-.63	1.39	57	.25	-.68	.93
34	.78	-.64	1.42	58	.41	-.69	1.10
35	.81	-.68	1.49				
36	.85	-.69	1.54				
37	.88	-.72	1.60				
38	.91	-.73	1.64				
41	.48	-.61	1.09				
42	.48	-.60	1.08				
43	.48	-.61	1.09				

TABLE 25

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST $\theta = 0°$

MODEL CONFIGURATION MRES

Ψ	C_D	C_L	C_Y	C_l	C_m	C_n	RUN NO
0	1.478	-.020	-.025	-.012	.002	-.005	5
15	1.450	-.025	-.438	-.012	005	-.026	6
30	1.274	-.025	-.818	-.009	.004	-.045	9
45	.997	-.024	-1.077	-.006	.004	-.055	10
60	.730	-.008	-1.141	-.027	.011	-.073	13
75	.419	.015	-.711	-.013	.007	.064	14
90	.259	.023	.118	-.005	.003	.123	17
105	.340	.015	.183	000	000	.102	20
120	.461	.010	.144	.002	.001	.140	21
135	.624	.010	.189	.003	.003	.139	24
150	.756	000	.180	.001	.005	.107	25
165	.833	-.004	.115	-.003	.011	.058	28
180	.919	-.013	-.009	-.009	.015	-.004	29
195	.836	-.013	-.128	-.011	.015	-.065	52
210	.741	000	-.225	-.014	.008	-.113	49
225	.611	000	-.197	-.014	.004	-.142	48
240	.439	.010	-.150	-.012	.001	-.137	45
255	.329	.020	-.199	-.009	000	-.096	44
270	.258	.010	-.024	.002	.003	-.120	41
285	.456	.015	.797	.003	.002	-.048	40

TABLE 26

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST $\theta = 0°$

MODEL CONFIGURATION MRES

ψ	C_D	C_L	C_y	C_l	C_m	C_n	RUN Nº
300	.755	.014	1.117	.012	.006	.074	37
315	1.032	-.014	1.018	-.010	-.002	.053	36
330	1.301	-.025	.762	-.012	000	.014	33
345	1.454	-.020	.386	-.012	.003	.023	32

TABLE 27

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST $\theta = 20°$

MODEL CONFIGURATION MRES

ψ	C_D	C_L	C_y	C_ℓ	C_m	C_n	RUN NO
0	1.391	-.571	-.024	-.010	-.062	-.002	53
15	1.332	-.566	-.199	000	-.061	-.022	56
30	1.153	-.561	-.808	.010	-.050	-.036	57
45	.946	-.519	-.935	.013	-.053	-.052	60
60	.695	-.448	-1.047	.016	-.039	-.056	61
75	.403	-.216	-.575	.004	.021	.072	64
90	.251	.049	.114	-.008	.035	.111	65
105	.333	.089	.187	-.007	.026	.095	68
120	.455	.093	.136	-.007	.044	.130	69
135	.589	.117	.166	-.006	.053	.127	72
150	.696	.133	.158	-.007	.060	.097	73
165	.819	.159	.093	-.009	.066	.053	76
180	.873	.168	000	-.009	.067	-.006	77
195	.811	.155	-.100	-.009	.067	-.059	80
210	.680	.137	-.156	-.006	.060	-.102	81
225	.561	.107	-.153	-.008	.052	-.126	84
240	.433	.089	-.129	-.005	.042	-.123	85
255	.314	.089	-.200	-.004	.016	-.086	88
270	.251	.025	-.029	-.001	.035	-.111	89
285	.431	-.251	.667	-.017	.011	-.054	92

TABLE 28

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY ____ MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST $\Theta = 20°$

MODEL CONFIGURATION MRFS

Ψ	C_D	C_L	C_y	C_l	C_m	C_n	RUN Nº
300	.733	-.426	1.005	-.018	-.051	.067	93
315	.963	-.500	.911	-.030	-.053	.048	96
330	1.173	-.551	.698	-.028	-.053	.036	97
345	1.346	-.556	.351	-.020	-.038	.020	100

TABLE 29

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST $\theta = 40°$

MODEL CONFIGURATION MRFS

ψ	C_D	C_L	C_y	C_l	C_m	C_n	RUN N°
0	1.106	-.986	-.029	-.007	-.111	-.001	101
15	1.042	-.972	-.310	.010	-.106	-.017	104
30	.954	-.911	—	.021	-.110	.013	105
45	.839	-.921	-.724	.048	-.122	-.047	108
60	.543	-.640	-.656	.032	-.032	.002	109
75	.352	-.295	-.324	.011	.047	.076	112
90	.252	.093	.096	-.012	.061	.089	113
105	.326	.202	.174	-.015	.045	.073	116
120	.417	.133	.072	-.009	.070	.098	117
135	.516	.166	.088	-.011	.088	.100	120
150	.592	.201	.077	-.011	.097	.074	121
165	.657	.224	.047	-.010	.104	.039	124
180	.671	.229	-.002	-.006	.107	-.003	125
195	.648	.219	-.049	-.005	.105	-.043	128
210	.576	.187	-.076	-.004	.096	-.078	129
225	.497	.152	-.080	-.004	.088	-.098	132
240	.395	.123	-.076	-.004	.068	-.094	133
255	.334	.226	-.243	-.006	.054	-.080	136
270	.248	.034	-.035	-.002	.060	-.089	137
285	.373	-.369	.382	-.031	.037	-.068	140

TABLE 30

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST $\theta = 40°$

MODEL CONFIGURATION MRFS

Ψ	C_D	C_L	C_Y	C_l	C_m	C_n	RUN NO
300	.574	-.682	.659	-.046	-.047	.010	141
315	.861	-.911	.686	-.059	-.118	.045	144
330	.960	-.911	.498	-.038	-.108	.031	145
345	1.078	-.996	.270	-.025	-.112	.016	148

TABLE 31

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST $\theta = 60°$

MODEL CONFIGURATION MRFS

Ψ	C_D	C_L	C_Y	C_l	C_m	C_n	RUN N°
0	.793	-	-.011	-.005	-.173	000	149
15	.728	-1.093	-.167	.008	-.153	-.016	152
30	.646	- .977	- .272	.021	-.107	-.014	153
45	.531	- .785	- .303	.032	-.044	.008	156
60	.394	- .519	- .248	.026	.029	.040	157
75	.290	- .197	- .102	.008	.075	.065	160
90	.256	.118	.061	-.015	.079	.065	161
105	.325	.315	.140	-.024	.077	.063	164
120	.352	.207	.072	-.010	.066	.054	165
135	.378	.149	.016	-.013	.077	.050	168
150	.405	.154	.004	- .006	.095	.042	169
165	.421	.159	- .001	- .005	.105	.021	172
180	.418	.163	- .006	- .005	.106	.001	173
195	.414	.154	- .001	- .004	.104	- .024	176
210	.398	.136	000	- .004	.093	- .042	177
225	.371	.141	- .040	- .001	.073	- .050	180
240	340	.207	- .083	.002	.063	- .052	181
255	.308	.280	- .133	.012	.078	- .061	184
270	.248	.064	- .034	- .001	.078	- .062	185
285	.300	- .261	.129	- .027	.070	- .062	188

TABLE 32

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST θ•60°

MODEL CONFIGURATION MRFS

ψ	C_D	C_L	C_Y	C_l	C_m	C_n	RUN NO
300	.408	-.580	.255	-.039	.017	-.035	189
315	.549	-.808	.286	-.043	-.054	-.005	192
330	.655	-.991	.246	-.032	-.115	.014	193
345	.738	-1.103	.141	-.015	-.151	.016	196

TABLE 33

TEST NO. 1016 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST $\theta = 80°$

MODEL CONFIGURATION MRFS

ψ	C_D	C_L	C_y	C_ℓ	C_m	C_n	RUN NO.
0	.326	-.433	-.005	-.006	.043	-.001	197
15	.342	-.413	-.011	-.003	.050	.008	200
30	.342	-.349	-.014	-.002	.060	.017	201
45	.322	-.236	-.006	000	.073	.027	204
60	.294	-.138	.004	000	.088	.035	205
75	.274	-.005	.007	-.005	.092	.038	208
90	.242	123	.026	-.013	.095	.036	209
105	.274	.216	.028	-.018	.092	.034	212
120	.306	.285	.023	-.019	.083	.032	213
150	.090	.339	.001	-.008	.070	.020	216
180	.305	.290	-.004	-.002	.060	000	217
210	.334	.334	-.008	.003	.073	-.020	220
240	.299	.266	-.022	.013	.083	-.033	221
270	.234	.084	-.014	.003	.093	-.035	224
300	.248	-.162	-.006	-.015	.083	-.037	225

TABLE 34

TEST NO. 1015 RUN NO. _____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST 0·0°

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_y	C_ℓ	C_m	C_n	RUN Nº
0	1.080	-.201	-.042	-.006	-.047	-.006	252
15	.932	-.238	-.249	.007	-.045	-.001	253
30	.807	-.159	-.383	.019	-.032	.014	256
45	.668	-.097	-.409	.021	-.011	.051	257
60	.500	-.029	-.300	.010	.008	.101	260
75	.371	000	-.136	.001	.006	.109	261
90	.276	.025	.048	-.002	.007	.079	264
105	.382	.044	.111	-.006	.010	.101	265
120	.482	.066	.135	-.010	.012	.119	268
135	.654	.080	.120	-.014	.007	.122	269
150	.714	.083	.097	-.014	.003	.099	272
165	.820	.096	.050	-.011	.002	.055	273
180	.855	.086	-.023	-.005	.001	-.001	276
195	.800	.083	-.088	-.002	.004	-.056	277
210	.687	.071	-.126	.002	.005	-.099	280
225	.583	.062	-.146	.002	.006	-.120	281
240	.459	.047	-.140	000	.009	-.116	284
255	.358	.030	-.113	-.001	.006	-.100	285
270	.269	.015	-.017	-.002	.008	-.078	288
285	.389	-.025	.197	-.013	.010	-.113	289

TABLE 35

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY ____ MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90MPH Sq 101.704 Sqc 254.26 Sq' 254.26

NATURE OF TEST $\Theta = 0°$

MODEL CONFIGURATION MRF

Ψ	C_D	C_L	C_Y	C_l	C_m	C_n	RUN Nº
300	—	-.056	.341	-.026	.006	-.093	292
315	.701	-.124	.404	-.034	-.057	-.050	293
330	.823	-.163	.334	-.030	-.040	-.021	296
345	.950	-.196	.169	-.020	- 045	-.010	297

TABLE 36

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST $\theta = 20°$

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_Y	C_l	C_m	C_n	RUN Nº
0	.873	-.435	-.032	-.009	-.053	-.005	300
15	.824	-.410	-.198	.012	-.045	.007	301
30	.758	-.350	-.311	.026	-.022	.027	304
45	.656	-.244	-.285	.020	.01[illegible]	.064	305
60	.478	-.117	-.209	.010	.035	.096	308
75	.363	-.034	-.104	.002	.035	.098	309
90	.271	.044	.032	-.003	.028	.071	312
105	.363	.084	.094	-.008	.036	.091	315
120	.465	.112	.103	-.011	.042	.105	316
135	.570	.133	.097	[illegible]4	.047	.105	317
150	.686	.150	.081	4	.054	.091	320
165	.729	.155	.035	[illegible]11	.059	.051	321
180	.756	.146	-.015	-.009	.058	-.001	324
195	.713	.142	-.063	-.003	.058	-.051	325
210	.665	.133	-.103	-.001	.055	-.090	328
225	.545	.120	-.112	000	.045	-.104	329
240	.440	.098	-.111	000	.039	-.102	332
255	.341	.066	-.102	000	.033	-.087	333
270	.267	.010	-.016	-.002	.026	-.072	336
285	.381	-.079	.146	-.017	.038	-.102	337

TABLE 37

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqh 254.26

NATURE OF TEST $\theta = 20°$

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_y	C_ℓ	C_m	C_n	Run No
300	.499	-.154	.238	-.023	.031	-.092	340
315	.415	-.257	.294	-.037	.005	-.059	341
330	.776	-.363	.275	-.039	-.048	-.030	344
345	.833	-.405	.144	-.028	-.046	-.016	345

TABLE 38

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST $\Theta = 40°$

MODEL CONFIGURATION MRF

Ψ	C_D	C_L	C_Y	C_l	C_m	C_n	RUN NO
0	.677	-.452	-.028	-.008	-.005	-.004	348
15	.653	-.416	-.097	.007	.003	.015	349
30	.595	-.329	-.133	.018	.024	.039	352
45	.534	-.234	-.144	.017	.049	.066	353
60	.445	-.128	-.115	.007	.056	.081	356
75	.341	-.044	-.058	-.001	.056	.075	357
90	.274	.049	.030	-.004	.041	.059	360
105	.350	.113	.057	-.009	.054	.072	361
120	.443	.152	.063	-.011	.063	.082	364
135	.510	.163	.067	-.010	.076	.079	365
150	.557	.168	.040	-.011	.080	.061	368
165	.605	.173	.025	-.009	.091	.034	369
180	.629	.177	-.007	-.006	.091	000	372
195	.596	.164	-.038	-.005	.091	-.036	373
210	.551	.155	-.050	-.003	.081	—	376
225	.499	.144	-.073	-.002	.073	-.077	377
240	.425	.128	-.074	.002	.060	-.081	380
255	.333	.079	-.059	000	.051	-.069	381
270	.269	.025	-.012	-.003	.041	-.059	384
285	.360	-.093	.090	-.012	.060	-.082	385

TABLE 39

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST $\theta = 40°$

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_l	C_l	C_m	C_n	RUN N°
300	.460	-.172	.136	-.022	.062	-.083	388
315	.554	-.259	.147	-.030	.051	-.065	389
330	.611	-.348	.114	-.032	.025	-.041	392
345	.664	-.429	.052	-.025	000	-.023	393

TABLE 40

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST $\theta = 60°$

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
0	.467	-.243	-.009	-.008	.060	.002	396
15	.458	-.215	-.016	.000	.062	.016	397
30	.430	-.192	-.015	.006	.060	.030	400
45	.405	-.136	-.015	.007	.064	.043	401
60	.351	-.070	-.022	.002	.061	.052	404
75	.298	-.010	-.010	-.002	.060	.046	405
90	.275	.054	.015	-.005	.051	.041	408
105	.325	.108	.021	-.008	.061	.047	409
120	.359	.126	.023	-.010	.065	.048	413
135	.411	.144	.010	-.010	.072	.047	414
150	.443	.159	.000	-.006	.078	.035	417
165	.454	.154	.002	-.004	.087	.001	418
180	.459	.154	-.003	-.004	.089	-.002	421
195	.452	.144	-.010	-.007	.087	-.021	422
210	.436	.136	-.008	-.004	.078	-.036	425
225	.404	.126	-.014	.000	.071	-.048	426
240	.351	.112	-.017	.002	.062	-.048	429
255	.309	.088	-.014	.000	.062	-.047	430
270	.269	.034	-.008	-.002	.053	-.042	433
285	.311	-.049	.022	-.011	.066	-.052	434

TABLE 41

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST $\theta = 60°$

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
300	.363	-.103	.030	-.011	.069	-.052	437
315	.416	-.144	.025	-.014	.069	-.044	438
330	.454	-.201	.007	-.016	.063	-.032	441
345	.464	-.233	-.003	-.016	.059	-.017	442

TABLE 42

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 90 MPH Sq 101.704 Sqc 254.26 Sqb 254.26

NATURE OF TEST $\theta = 80°$

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_Y	C_l	C_m	C_n	RUN NO.
0	.296	-.034	.002	-.004	.058	.001	228
30	.315	-.025	.032	-.005	.057	.012	229
60	.296	.025	.023	.037	.051	.017	232
90	.261	.059	.004	-.004	.059	.023	233
120	.325	.084	-.009	-.006	.060	.025	236
150	.343	.089	-.020	-.002	.061	.018	237
180	.334	.074	-.004	-.001	.062	-.001	240
210	.345	.079	.016	-.005	.060	-.020	241
240	.323	.079	.000	.000	.060	-.025	244
270	.256	.044	.002	-.003	.058	-.024	245
300	.305	.015	-.012	-.001	.057	-.020	248
330	.325	-.025	-.032	-.002	.061	-.003	249

TABLE 43

TEST NO. 1015 RUN NO. _____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc 113.01 Sqb 113.01

NATURE OF TEST $\theta = 0$

MODEL CONFIGURATION MRFS

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
0	1.458	-.011	-.020	-.012	.003	.003	4
15	1.400	-.011	-.428	-.012	.002	-.037	7
30	1.256	-.022	-.794	-.012	.008	-.001	8
45	.987	-.010	-1.023	-.006	.006	-.056	11
60	.733	.010	-1.104	-.024	.009	-.073	1
75	.418	.011	-.686	-.015	.005	.064	15
90	.262	.022	.122	-.008	.001	.121	16
105	.340	.022	.183	-.004	-.001	.100	19
120	.464	.011	.146	-.001	.000	.141	22
135	.618	.016	.193	-.002	.003	.136	23
150	.751	.020	.188	-.004	.003	.106	26
165	.808	-.009	.128	-.003	.012	.054	27
180	.902	-.009	-.008	-.007	.009	-.002	30
195	.810	.010	-.128	-.010	.012	-.066	51
210	.776	.000	-.180	-.013	.008	-.113	50
225	.595	.010	-.196	-.014	.006	-.143	47
240	.421	.000	-.139	-.011	.002	-.131	46
255	.325	.011	-.215	-.010	.000	-.105	43
270	.255	.011	-.058	.001	.003	-.122	42
285	.453	.011	.759	.003	.002	-.044	39

TABLE 44

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc 113.01 Sqb 113.01

NATURE OF TEST $\theta = 0$

MODEL CONFIGURATION MRFS

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
300	.756	.031	1.112	.020	.011	.077	38
315	1.036	-.021	1.007	.012	.000	.056	35
330	1.277	-.011	.751	-.014	.000	.041	34
345	1.425	-.022	.383	-.013	.002	—	31

TABLE 45

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc 113.01 Sqb 113.01

NATURE OF TEST $\theta = 20°$

MODEL CONFIGURATION MRFS

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
0	1.353	-.542	-.022	-.009	-.065	.001	54
15	1.307	-.564	-.572	.000	-.059	-.022	55
30	1.132	-.536	-.881	.011	-.047	-.035	58
45	.946	-.515	-.935	.015	-.057	-.057	59
60	.697	-.442	-.989	.019	-.039	-.057	62
75	.395	-.210	-.559	.002	.019	.073	63
90	.254	.055	.127	-.011	.033	.108	66
105	.332	.100	.196	-.012	.025	.093	67
120	.451	.100	.133	-.010	.041	.127	70
135	.589	.126	.172	-.010	.053	.127	71
150	.689	.140	.140	-.010	.059	.092	74
165	.802	.159	.097	-.009	.064	.053	75
180	.856	.159	.000	-.007	.067	-.003	78
195	.811	.155	-.100	-.006	.064	-.062	79
210	.655	.130	-.141	-.005	.060	-.097	82
225	.569	.116	-.149	-.008	.051	-.125	83
240	.436	.077	-.120	-.004	.043	-.122	86
255	.312	.089	-.200	-.005	.015	-.085	87
270	.249	.000	-.006	-.004	.034	-.105	90
285	.434	-.243	.686	-.017	.010	-.054	91

TABLE 46

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc 113.01 Sqb 113.01

NATURE OF TEST $\theta = 20°$

MODEL CONFIGURATION MRFS

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
300	.731	-.431	1.009	-.019	-.054	.070	94
315	.952	-.484	.891	-.032	-.055	.052	95
330	1.164	-.558	.693	-.029	-.054	.035	98
345	1.316	-.553	.351	-.022	-.061	.021	99

TABLE 47

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORIES MODEL: SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc 113.01 Sqb 113.01

NATURE OF TEST $\theta = 40°$

MODEL CONFIGURATION MRFS

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
0	1.097	-1.009	-.021	-.009	-.114	.001	102
15	1.039	-.946	-.304	.010	-.111	-.018	103
30	.944	-.904	-.529	.024	-.115	-.035	106
45	.846	-.975	-.717	.049	-.128	-.048	107
60	.541	-.652	-.639	.034	-.032	.002	110
75	.348	-.288	-.327	.011	.044	.077	111
90	.250	.077	.080	-.015	.059	.089	114
105	.325	.188	.191	-.015	.045	.072	115
120	.412	.133	.073	-.012	.068	.094	118
135	.515	.166	.086	-.014	.085	.096	119
150	.586	.189	.067	-.011	.096	.072	122
165	.645	.231	.049	-.009	.102	.036	123
180	.666	.253	.002	-.006	.106	-.003	126
195	.641	.200	-.045	-.004	.106	-.043	127
210	.576	.200	-.108	-.005	.097	-.078	130
225	.493	.144	-.075	-.004	.088	-.095	131
240	.384	.111	-.065	-.006	.064	-.088	134
255	.329	.232	-.247	-.005	.053	-.081	135
270	.248	.022	-.022	-.004	.059	-.086	138
285	.376	-.387	.391	-.032	.030	-.065	139

TABLE 48

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORIES MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc 113.01 3q'c 113.01

NATURE OF TEST $\theta = 40°$

MODEL CONFIGURATION MRES

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
300	.584	-.683	.662	-.048	-.051	.011	142
315	.856	-.915	.676	-.067	-.125	.052	143
330	.963	-.925	.503	-.043	-.113	.032	146
345	1.064	-.978	.277	-.029	-.115	.014	147

TABLE 49

TEST NO. 1015 RUN NO. _____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc 113.01 Sqb 113.01

NATURE OF TEST $\theta = 60°$

MODEL CONFIGURATION MRFS

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
0	.792	-1.195	-.004	-.007	-.175	.000	150
15	.730	-1.093	-.163	.009	-.154	-.019	151
30	.645	-.957	-.268	.022	-.109	-.013	154
45	.532	-.778	-.302	.030	-.047	.007	155
60	.396	-.515	-.241	.027	.027	.038	158
75	.293	-.210	-.108	.007	.074	.065	159
90	.259	.122	.058	-.013	.080	.064	162
105	.318	.310	.144	-.023	.076	.059	163
120	.345	.210	.071	-.005	.063	.056	166
135	.376	.168	.029	-.013	.077	.049	167
150	.407	.147	.000	-.004	.095	.041	170
165	.420	.158	.004	-.004	.105	.022	171
180	.422	.158	.002	-.004	.107	.000	174
195	.411	.158	.002	-.028	.103	-.025	175
210	.400	.137	.004	.044	.091	-.040	178
225	.378	.168	-.027	-.004	.071	-.048	179
240	.338	.221	-.069	.002	.060	-.050	182
255	.301	.277	-.135	.010	.074	-.052	183
270	.250	.044	-.024	-.005	.077	-.062	186
285	.299	-.277	.131	-.031	.065	-.062	187

TABLE 50

TEST NO. 1015 RUN NO. _____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc 113.01 Sqb 113.01

NATURE OF TEST $\theta = 60°$

MODEL CONFIGURATION MRFS

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
300	.413	-.589	.268	-.042	.013	-.033	190
315	.550	-.820	.290	-.048	-.061	-.002	191
330	.658	-.998	.252	-.032	-.121	.015	194
345	.732	-1.103	.139	-.014	-.156	.019	195

TABLE 51

TEST NO. 1015 RUN NO. _____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc 113.01 Sqb 113.01

NATURE OF TEST $\theta = 80°$

MODEL CONFIGURATION MRFS

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
0	.325	-.443	-.011	-.006	.039	.000	193
15	.336	-.421	.002	-.004	.045	.009	199
30	.343	-.365	-.024	-.001	.058	.016	202
45	.322	-.243	-.009	.000	.071	.029	203
60	.294	-.144	.002	.000	.088	.033	206
75	.274	-.011	.000	-.007	.092	.037	207
90	.240	.111	.019	-.012	.095	.035	210
105	.265	.199	.019	-.017	.092	.034	211
120	.304	.266	.019	-.019	.081	.031	214
150	.331	.332	-.011	-.007	.070	.021	215
180	.308	.299	-.002	-.001	.062	.000	218
210	.330	.332	-.006	.003	.070	-.021	219
240	.292	.232	-.030	.012	.083	-.033	222
270	.237	.055	-.011	.002	.093	-.036	223
300	.300	-.177	-.002	-.015	.081	-.035	226

TABLE 52

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc 113.01 Sqb 113.01

NATURE OF TEST $\theta = 0$

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
0	.948	-.197	-.035	-.007	-.048	-.007	251
15	.925	-.188	-.245	.008	-.045	-.001	254
30	.796	-.150	-.378	.018	-.032	.014	255
45	.668	-.090	-.387	.020	-.011	051	258
60	.498	-.031	-.288	.009	.005	.101	259
75	.367	.000	-.140	.001	.007	.109	262
90	.271	.033	.045	-.003	.006	.080	263
105	.373	.044	.110	-.006	.010	.100	266
120	.489	.063	.135	-.013	.010	.119	267
135	.618	.069	.136	-.012	.006	.122	270
150	.718	.094	.105	-.014	.003	.099	271
165	.807	.094	.059	-.012	.001	.054	274
180	.839	.089	-.010	-.006	.001	-.001	275
195	.791	.085	-.092	-.001	.005	-.054	278
210	.678	.071	-.126	.002	.005	-.099	279
225	.582	.050	-.140	.002	.006	-.119	282
240	.456	.047	-.140	.000	.009	-.116	283
255	.350	.022	-.108	-.002	.008	-.095	286
270	.262	.015	-.017	-.002	.008	-.078	287
285	.385	-.033	.200	-.014	.010	-.109	290

TABLE 53

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc 113.01 Sql 113.01

NATURE OF TEST $\theta = 0$

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
300	.524	-.063	.337	-.026	.003	-.090	291
315	693	-.110	.391	-.033	-.018	-.050	294
330	.817	-.169	.326	-.031	-.041	-.023	295
345	.937	-.188	.170	-.019	-.045	-.011	298

TABLE 54

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc 113.01 Sqb 113.01

NATURE OF TEST $\theta = 20°$

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_Y	C_l	C_m	C_n	RUN NO.
0	.861	-.423	-.037	-.006	-.054	-.007	299
15	.810	-.405	-.190	.010	-.046	.006	302
30	.749	-.359	-.300	.026	-.022	.028	303
45	.605	-.219	-.271	.019	.012	.063	306
60	.482	-.105	-.204	.010	.032	.095	307
75	.358	-.033	-.103	.002	.035	.096	310
90	.267	.044	.037	-.004	.027	.072	311
105	.363	.089	.095	-.011	.035	.091	314
120	.454	.116	.098	-.012	.041	.103	315
135	.562	.130	.091	-.014	.047	.104	318
150	.683	.149	.089	-.016	.054	.089	319
165	.722	.160	.037	-.012	.057	.049	322
180	.750	.141	-.013	-.009	.058	-.002	323
195	.706	.141	-.057	-.003	.057	-.051	326
210	.660	.130	-.095	.003	.053	-.091	327
225	.543	.120	-.103	.000	.048	-.103	330
240	.440	.098	-.111	.000	.039	-.102	331
255	.329	.066	-.086	.000	.034	-.087	334
270	.265	.011	-.028	-.004	.026	-.071	335
285	.374	-.066	.144	-.017	.040	-.099	338

TABLE 55

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH. Sq 45.205 Sqc 113.01 Sqh 113.01

NATURE OF TEST $\theta = 20$

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
300	.492	-.147	.229	-.027	.030	-.089	339
315	.629	-.249	.284	-.036	.005	-.059	342
330	.764	-.348	.271	-.039	-.026	-.031	343
345	.719	-.386	.139	-.027	-.046	-.016	346

TABLE 56

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc 113.01 Sqb 113.01

NATURE OF TEST $\theta = 40°$

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
0	.680	-.448	-.020	-.007	-.005	-.003	347
15	.650	-.409	-.097	.005	.003	.014	350
30	.567	-.332	-.133	.016	.020	.038	351
45	.535	-.231	-.143	.016	.046	.066	354
60	.447	-.123	-.118	.005	058	.080	355
75	.337	-.055	-.039	.000	.053	.078	358
90	.271	.044	.026	-.003	.041	.059	359
105	.349	.100	.058	-.011	.052	.071	362
120	.441	.144	.073	-.013	.066	.080	363
135	.511	.158	.066	-.014	.073	.077	366
150	.555	.169	.044	-.012	.079	.060	367
165	.594	.179	.025	-.008	.088	.033	370
180	.523	.179	-.008	-.008	.091	.000	371
195	.599	.169	-.029	-.004	.089	-.034	374
210	549	.140	-.056	-.004	.079	-.060	375
225	.496	.147	-.071	.000	.072	-.075	378
240	.430	.122	-.067	.001	.061	-.060	379
255	.352	.100	-.054	.000	.051	-.070	382
270	.264	.025	-.001	-.004	.040	-.053	383
285	.348	-.089	.075	-.013	.059	-.081	386

TABLE 57

TEST NO. 1015 RUN NO. _____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH. Sq 45.205 Sqc 113.01 Sqv 113.01

NATURE OF TEST $\theta = 40°$

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
300	.469	-.177	.138	-.024	.061	-.081	387
315	.551	-.274	.243	-.030	.047	-.066	390
330	.613	-.348	.114	-.032	.025	-.039	391
345	.656	-.419	.056	-.024	.000	-.021	394

TABLE 18

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc .113.01 Sqb 113.01

NATURE OF TEST $\theta = 60^\circ$

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
0	.467	-.241	-.002	-.010	.058	.001	395
15	.457	-.210	-.014	.000	.059	.014	398
30	.442	-.190	-.012	.003	.060	.032	399
45	.403	-.126	-.014	.005	.061	.043	402
60	.397	-.073	-.018	.000	.062	.048	403
75	.293	-.011	-.009	-.002	.059	.044	406
90	.272	.044	.017	-.007	.050	.041	407
105	.319	.111	.019	-.009	.059	.045	410
120	.354	.116	.027	-.013	.065	.048	412
135	.405	.144	.012	-.010	.072	.047	415
150	.439	.147	.002	-.009	.078	.035	416
165	.458	.147	.006	-.005	.087	.018	419
180	.462	.147	.002	-.006	.089	-.001	420
195	.448	.137	-.004	-.007	.084	-.020	423
210	.435	.137	.000	-.006	.078	-.035	424
225	.395	.031	-.010	.000	.069	-.044	427
240	.344	.116	-.018	.001	.062	-.047	428
255	.303	.077	-.015	.000	.058	-.045	431
270	.264	.022	.000	-.004	.049	-.042	432
285	.306	-.055	.022	-.010	.065	-.053	435

TABLE 59

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1961

WIND SPEED 60 MPH Sq 45.205 Sqc 113.01 Sqc 113.01

NATURE OF TEST $\Theta = 60°$

MODEL CONFIGURATION MIT

ψ	C_D	C_L	C_Y	C_ℓ	C_m	C_n	RUN NO.
300	.359	-.105	.037	-.012	.067	-.052	436
315	.416	-.158	.025	-.016	.067	-.043	439
330	.449	-.210	.010	-.017	.061	-.032	440
345	.460	-.231	.006	-.017	.058	-.018	443

TABLE 60

TEST NO. 1015 RUN NO. ____

LINCOLN LABORATORY MODEL SCANNER

WRIGHT BROTHERS WIND TUNNEL, M.I.T. DATE NOVEMBER 1941

WIND SPEED 60 MPH q 46.305 q_{ac} 11.01 q_{ab} 11.01

NATURE OF TEST $\theta = 00°$

MODEL CONFIGURATION MRF

ψ	C_D	C_L	C_Y	C_l	C_{m_1}	C_m	RUN NO.
0	.292	-.044	.003	-.001	.058	.000	227
30	.316	-.022	.026	-.005	.056	.012	230
60	.297	.021	.024	-.007	.052	.020	231
90	.252	.055	.004	-.004	.058	.022	234
120	.317	.009	-.011	-.006	.060	.023	235
150	.336	.039	-.017	-.002	.059	.020	238
180	.330	.027	-.011	-.003	.061	-.004	239
210	.341	.027	.015	-.005	.059	-.014	242
240	.315	.066	.004	-.001	.058	-.023	243
270	.252	.033	-.002	-.003	.058	-.024	246
300	.303	.000	-.009	-.003	.057	-.031	247
330	.320	-.033	-.026	-.004	.060	-.009	250